

DESIGN OF A COMBINED SEWER SYSTEM
FOR PEOTONE WILL CO. ILLINOIS

BY
H. F. ISRAEL
G. L. OPPER

ARMOUR INSTITUTE OF TECHNOLOGY

1913

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Design of a combined sewer
system for the village of

DESIGN
OF A
COMBINED SEWER SYSTEM
FOR THE
VILLAGE OF PEOTONE
WILL COUNTY
ILLINOIS.

A THESIS PRESENTED BY

Henry J. Israel

AND

George L. Upper

TO THE

PRESIDENT AND FACULTY

OF

ARMOUR INSTITUTE OF TECHNOLOGY

FOR THE DEGREE OF

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

HAVING COMPLETED

THE PRESCRIBED COURSE

IN CIVIL ENGINEERING.

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A C K N O W L E D G E M E N T .

We hereby take this means of thanking both Mr. C.N. Roberts, and Mrs. Julia Beveridge for such data and valuable information as was needed for this thesis.

The Village of Peotone is located on the Illinois Central Railroad about 40 miles south of Chicago in Will County. The population is about 1200 and consists largely of well-to-do retired farmers. At present there are several sanitary sewers in operation, but owing to defects in design and construction they have proved nuisances in wet seasons. The inadequacy of such systems was more than demonstrated in the past season, and a movement was started to install a complete system of sewers for the entire village. Mr. C.E. Roberts was retained to draw up the plans for the system and thru his kindness we were enabled to become familiar with the details of the layout.

Late in October we spent several days in Peotone running street levels under the direction of Mr. Sammons, the assistant engineer, and were thus able to become thoroughly familiar with the work at hand.

The Village is divided into what might be termed two distinct districts by the Illinois Central Railroad, due to the fact that this railroad's right of way occupies the high ground thru the center of the village. There results what we term the East and West sewers districts.

From a topographic map previously compiled by Mr. Roberts a study of the districts was made. The natural outlet of the West district is in a creek about one mile west of the village limits. The outlet of the East district is in a creek about one mile south of South street.

It was deemed advisable to utilize the East district outlet for both East and West districts by running a main lateral on West St. and crossing the Illinois Central Railroad on South St. , and connecting at East St. with the main lateral of the East district, thence south to the outlet in the creek before mentioned.

An outlet was provided for by the purchase of a strip of land adjoining the creek and East St.

In the selection of the type and extent of the system it was deemed advisable to adopt the combined system as most suited to the needs of the community. The financial resources of the Village and the reluctance to pay the additional cost of a separate system further confirmed the selection of the combined system.

The present growth of the Village tends to the west of East St. and this further growth has been provided for in our design, however, should a phenomenal growth take place, such addition could easily be provided for in the outlet previously referred to under the West district.

Mr. Roberts as Village Engineer was in possession of an accurate map of the Village giving the location of the streets and alleys and lots. From the map it was found that the lot frontages with but few exceptions were on the East and West streets.

The slope of the east district was generally to the east and south, which determined the location

of the east district main sewer on East St. The previous selection of West Street as the location of the west district main sewer was confirmed by a study of that district. The slope here was to the west from the railroad. West St. further proved most satisfactory in presenting the most economical main to intercept the various laterals and give the shortest line across South st.

With these preliminary considerations a study of rainfall and runoff conditions was made.

A study of the area showed that the surface drainage was away from the Village in all directions thus presenting no difficulties in the way of intercepting large quantities of surface water from outside sources. The streets though not paved are in good condition and seem ^{supplied} well with gutters for drains. Paving is likely to follow the installation of the sewer system and adequate catch basins facilities were provided to take the street drainage in that event. In view of the fact that the soil is of deep loam and the runoff is not considered excessive, only average storms were provided for in the design.

With the field notes at hand, the street profiles were plotted on profile paper in such a manner as to make the checking of street intersections as easy as possible. Below each profile enough space was allowed to show a plan view of the location of sewer line, man holes and catch basins.

For storm water calculations the so-called "Rational Method" of computations was used, as outlined by S.A. Greely in his paper on a "Brief Discussion of Rainfall and its Runoff into Sewers", presented to the Western Society of Engineers on April 12, 1913. This method of computation requires,

1. The determination of the area contributing rainfall to a point on the sewer.

2. The selection of the average rate of rainfall to make all parts of this area tributary.

3. An estimate of the proportion of this rainfall reaching the sewer at the time of maximum discharge- the rainfall and runoff being expressed as rate of flow.

The method is expressed by the equation

$$Q = Cr\sqrt{A}$$

where C is the ratio of the average rate of rain-

fall for a period of time equal to the time of concentration for each particular area, to the maximum rate of flow in the concentration.

The "time of concentration" means the duration of rainfall necessary to make all parts of the area tributary to the given point on the sewer.

Q is the total discharge of the tributary area in cubic feet per second.

r is a rate of rainfall in inches per hour.

A is the tributary area in acres.

Values of C were obtained from a summary of the paper.

By consulting a plate of curves in Ogden's "Sewer Design" based on Kutter's formula for vitrified pipes, also Folwell's "Sewerage", the size of sewers on various grades and velocity of flow was obtained. The required size of pipe was obtained by selecting a pipe of such size as would carry the required sewerage on a given grade and give a velocity within the required limits.

The velocity of flow is given by the formula

$$V = c \sqrt{rs} \quad (\text{Chezy's})$$

where v = velocity

s = slope

c = a constant determined by Kutter's formula.

Kutter's formula for a 12" pipe on 0.4 %
grade

$$C = \frac{41.6 + \frac{.000281}{S} + \frac{1.811}{n}}{1 + \left(41.6 + \frac{.000281}{S}\right) \frac{n}{\sqrt{r}}}$$

where n = coefficient of roughness

s = slope

r = hydraulic radius

$$\begin{aligned} \text{Hence } V &= C \sqrt{rs} \\ &= 86.3 \sqrt{2.5 \times .004} \\ &= 2.84 \text{ feet.} \end{aligned}$$

This value was used for pipes of this
size and grade.

Manholes were placed at street intersections.

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*
* SPECIFICATIONS *
* AND *
* FORMS *
*
*

NOTICE FOR BIDS

Special Assessment No. _____.

Sealed proposals or bids for constructing and laying a vitrified tile pipe sewer in the Village of Peotone in accordance with the ordinance and specifications for said improvement, will be received by the Board of Local Improvements of the Village of Peotone until 8:00 o'clock on the _____ day of _____, at which time said proposals or bids will be publicly opened by the said Board of Local Improvements in the Village Hall of the said Village of Peotone.

Said work to be done in accordance with the ordinance, plans and specifications for the same on file in the office of the Village Clerk of said Village and also at the office of _____ Engineer, _____.

Proposals for bids must be made out on blanks furnished by the Village Clerk of said Village and must be addressed to the Board of

Local Improvements of the Village of Peotone,
Peotone Illinois, and indorsed, "Proposal for
sewer in Peotone Illinois", and each proposal
or bid must be accompanied by cash or by a
check, payable to the order of the President
of the Board of Local Improvements of the
Village of Peotone in his official capacity,
certified by a responsible bank, for an amount
not less than ten per cent. of the aggregate
of the proposal, and no proposal or bid will
be considered unless accompanied by such check
or cash. Bids will be opened by Board of
Local Improvements at 8:00 o'clock p.m. on
_____ day of _____, in the Village
Hall of said Village of Peotone.

The contractor to whom the contract
may be awarded, will be required to execute a
bond to the satisfaction and approval of the
Board of Local Improvements of said Village in

a sum equal to fifty per cent. of the amount of his contract, such bond to be conditioned for the faithful performance of the contract.

The contractor will be paid in bonds and vouchers, payable solely out of the special assessment for said improvement when collected, pursuant to the statute in such case made and provided, which bonds will bear interest at the rate of five per cent. per annum.

Companies or firms bidding will give the individual names with their respective addresses as well as the name of the firm.

No proposal will be considered unless the party offering it shall furnish evidence satisfactory to the Board of Local Improvements of said Village that he has the necessary facilities together with sufficient pecuniary resources to fulfill the conditions of the contract and specifications, provided such contract should be

awarded him.

Peotone Illinois, _____

President Board of Local Improvements.

Attest:

_____ Sec'y.

P R O P O S A L .

TO THE SEWER COMMISSION OF THE TOWN OF _____

GENTLEMEN:- The undersigned hereby propose to furnish all of the materials and do all of the work required to complete such amount of the above mentioned work as shall be awarded to the undersigned by the Town of _____ in a first class manner, and in accordance with the specifications hereto annexed , and the plans and drawings of same on file in your Engineer's office, at the following prices, viz:

A R T I C L E S C F A G R E E M E N T.

BETWEEN THE TOWN OF _____
PARTY OF THE FIRST PART, AND _____
CONTRACTOR, PARTY OF THE SECOND PART, FOR BUILD-
ING _____ SEWERS IN _____

This agreement, made and entered into this
_____ day of _____ in the year one
thousand _____ hundred _____ by and be-
tween the Town of _____, party of the
first part, and _____ Contractor
party of the second part.

WITNESSETH, Whereas, the Town of _____
in the State of _____, by virtue of the
authority vested in the Sewer Commission by
Legislature of the State of _____ and by
the Charter and Ordinances of the Town, agree

to let unto the said _____ Contractor
the work of constructing certain _____
Sewers, as per plans and profiles of the work on
file in the office of the Engineer of Sewers.

NOW, THEREFORE, in consideration of the
payment and covenants hereinafter mentioned to be
made and performed by said party of the first part ,
the said _____ hereby covenants and
agrees to do the work above mentioned in a substantial
and workmanlike manner, in conformity with the plans,
profiles and specifications of such work on file in
the office of the Engineer, in strict obedience to the
directions which may from time to time be given by
the said Engineer or his duly authorized assistants,
and in accordance with the following specifications.

SPECIFICATIONS.

EXCAVATING.

The trenches for the Sewers are to be excavated in such directions and manners as required and to the depth necessary to secure the proper grades.

In wet trenches that require to be sheeted, and where provision is to be made to keep the Sewers dry during the construction, the widths of the trenches for the brick sewers inside the sheeting are to be three feet greater than the outside diameter of the sewer. For twelve and fifteen-inch pipe sewers sheeted trenches are not to be less than five feet in width. In dry trenches, where no provision is to be made to protect the work from water, and that do not have to be sheeted, the width of the trenches are to be such as to permit of the work being constructed in the manner and size as specified. Wherever the nature of the ground will admit of it, the bottom of the excavation is to have the shape and dimensions of the outside of the lower half of the Sewer. In order to secure this the Contractor is to provide a pattern or form, made with two segments, one to fit the outside and the other the inside of the invert. It is to be firmly and securely set to the proper grade by the stake given by the Village Engineer of the Village of _____, and is to remain unmoved in its position until after the

masonry is laid. The bed for the Sewers is then brought to the required shape by trimming, with suitable tools, to a line stretched from the outside of the masonry to the form.

The material excavated shall be deposited on the side of the trenches, beyond reach of the slides. The banks shall be trimmed ^{and} kept up, so as to be of as little inconvenience as possible to the public travel or to tenants occupying adjoining property. In case the street is not wide enough to furnish room for deposit without obstructing the sidewalk, the Contractor is to erect and maintain in front of all buildings, a suitable barrier, to keep the earth at least three feet off of the inner portion of the walk.

All water, or other kind of pipes, are to be carefully supported and protected from injury by the Contractor, either until the sewer is built and the back filling finished, or, if it is necessary, until the proper village officer shall remove or change them.

All paving, graveling, macadamizing, planking, side walks, culverts, and cross walks, or any street paving or walk whatever, are to be carefully removed before the excavation is made, and kept separate from other

excavated material.

If so required, the excavating of trench shall not advance more than one hundred feet ahead of the complete masonry or pipe work.

When rock is encountered in excavating the trenches, it is to be removed by drilling and blasting, or otherwise, to the surface of the outside of the bottom of the Sewer. Wherever a main water or gas pipe crosses the line of trench, the rock on each side of the pipe, for a distance of five feet is to be removed without blasting.

When blasts are being made, the trench is to be carefully covered with suitable brush or timber to prevent danger to life and property,

Before the Sewer is built, all irregularities of the rock are to be filled with sand or gravel, well rammed into its place, or with brick and mortar, as directed by the Board of Local Improvements of the Village of _____.

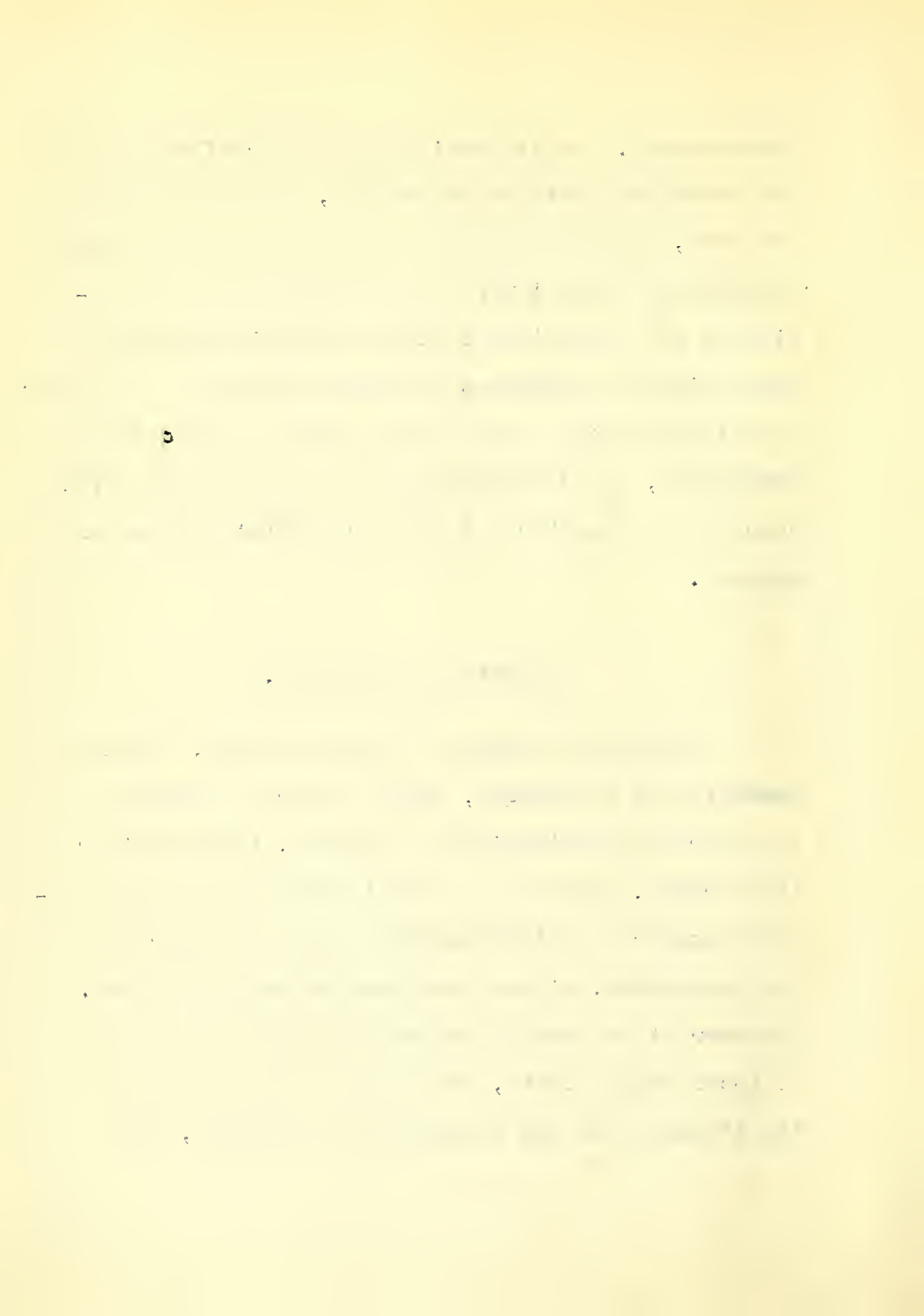
For all rock excavation, in addition to his price per foot of Sewer, the Contractor is to receive a compensation to be fixed by said Board of Local



Improvements. In estimating the number of cubic yards the necessary width of the trench, at the surface of the rock, by the depth from the surface of the rock to the bottom of the invert of the Sewer is to be considered the dimensions of the rectangular section upon which the estimates of quantities are to be based; no allowance being made for excavation beyond these boundaries, nor deduction made for the portion which comes on the quarters of the invert that may not be removed.

SHEETING AND BRACING.

In case the depth of the excavation, or the character of the ground, shall render it necessary to secure the protection of the work, the street or the workmen, the sides of the trench are to be effectually supported with suitable planks or timbers by the Contractor, without any expense to the Village. Wherever it is thought necessary by the said Board of Local Improvements, the timber is to remain in the trench after the completion of the work, and



the Contractor will be paid therefor by board measure, at current reates. Otherwise the sheeting and braces are to be removed as the back filling progresses.

FOUNDATIONS.

Wherever the ground is sufficiently firm and unyielding, the masonry, or pipes, are to be laid directly on the bottom of the excavation; but whenever this shall not be the case, the Contractor is to furnish and put into place, without extra expense, sand, gravel or other suitable material. And in case it is considered necessary by the Board of Local Improvements, the Contractor is, without extra expense, to lay a foundation of plank or timber, which will be furnished him for the purpose by the Village.

PROTECTION AGAINST WATER.

The Contractor is to do all the pumping and bailing, to build all drains, and do all other necessary work to keep the trench and Sewer clear

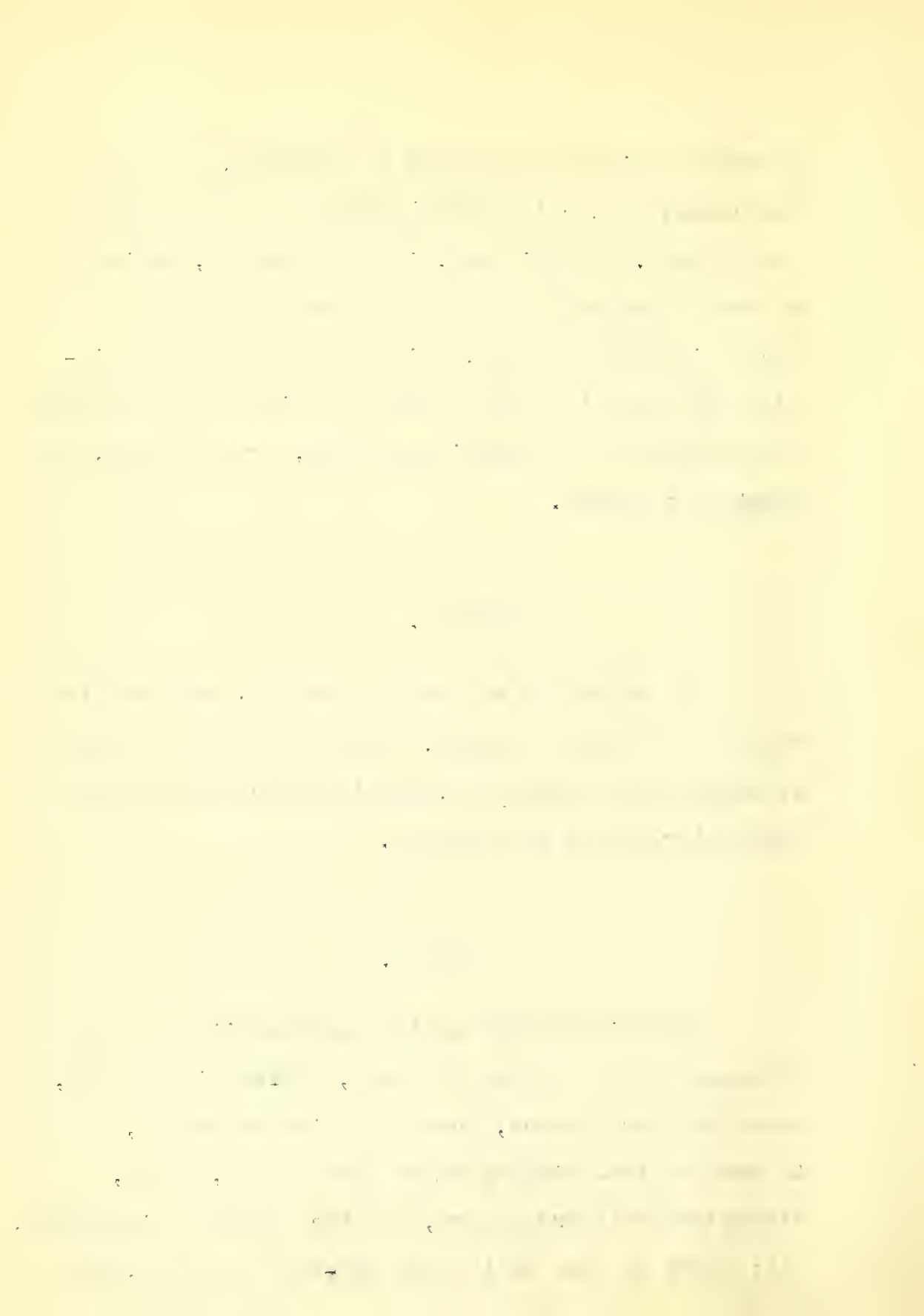
of water during the progress of the work, and until the cement mortar is sufficiently set to be safe from injury. To this end, in wet trenches, he is to keep a channel open on each side of the work during its construction, which shall be so maintained as to catch the water from both sides of the trench and conduct it to a sufficient pump, or bail hole, in front of the work.

MATERIALS.

All materials of whatever nature, required in the construction of Sewers, except such lumber only as hereinbefore mentioned, shall be furnished by the Contractor at his own expense.

BRICKS.

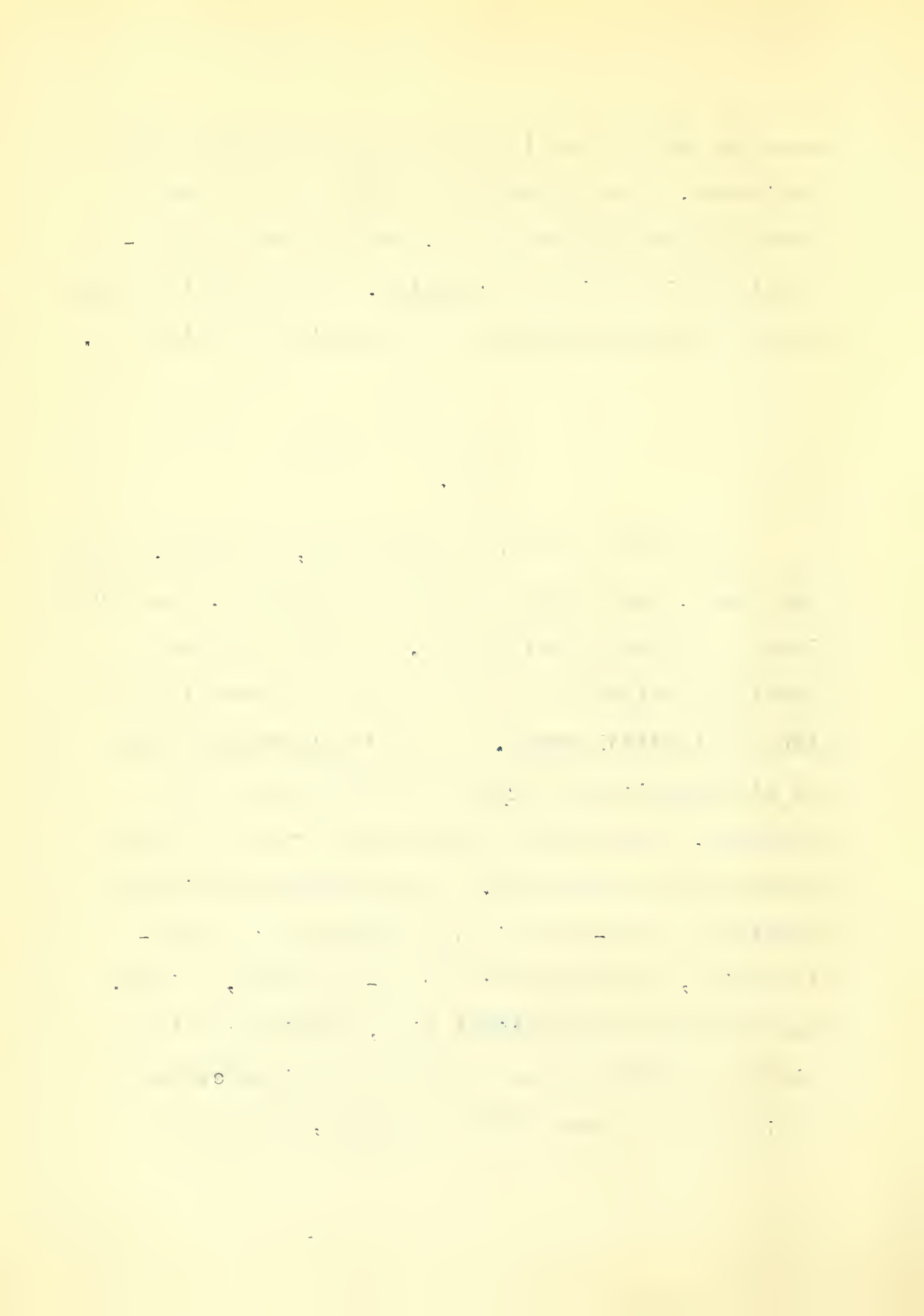
The bricks shall be the best quality for the purposes for which they are used, uniform in quality, sound and hard burned, free from line or cracks, and to have a clear ringing sound when struck, whole, with edges full and square, and the standard dimensions, viz: eight by four by two and one-fourth inches, and



said bricks will be inspected upon the ground when delivered, by an inspector appointed by the said Board of Local Improvements, and all bats and defective bricks will be rejected. All rejected bricks shall at once be removed from the line of said work.

PIPE.

The pipe shall be socket pipe, straight, smooth and sound, thoroughly burned and vitrified, free from lumps or other imperfections, and with the least possible variation from the specified dimensions of true cylindrical shape. All straight pipe must be straight in the direction of the axis of the cylinder, and the inner and outer surface of each pipe must be concentric. The standard of thickness shall be for 18-inch pipe, 1 1/4 inches; for 15-inch pipe, 1 1/8 inches; for 12-inch pipe, 1 inch, and for nine inch straight pipe, 7/8 inch; with a limit of variation not exceeding 1/8 inch either way; all to be made with butt joint, square and



with right angles with the axis of the pipe. The "curves", "slant" and "Y junctions" must conform to all the foregoing requirements as regards quality, form and workmanship, and their thickness shall be equal to that of the pipes of the same caliber into which they may be worked or jointed. All slant junctions to be cut and all branch junctions to be molded for an angle of 34 degrees with the Sewer with which they are to connect. One fourth of all the straight pipe must be in two foot lengths. All the pipes shall be subject to inspection and approval or rejection of the said Board of Local Improvements, and shall be equal in quality to the best pipe heretofore used in the construction of Sewers in this village, and all rejected pipes shall upon notice be removed from the line of work by the Contractor.

CEMENT.

The cement shall be fresh made, and of some satisfactory and reliable brand, and of such quality

and uniformity as has been demonstrated in years past to be of superior quality and thoroughly adapted to the construction of Sewers and similar work, to be approved by said Board of Local Improvements.

Cement shall be so finely ground that 80 per cent of the whole will pass through a sieve of 80 meshes to the lineal inch, and when tested in the usual manner for tensile strength, shall give results comparing favorably with the best brands of American cement.

MORTAR.

The mortar shall be made carefully measuring and carefully incorporating two parts of cement with three parts of clean Lake shore sand in dry state, and mixed with clean water to the proper consistency and shall be used while fresh, and the use of the mortar which has been set and then retempered will not be allowed. In wet trenches, and when required

by the said Board of Local Improvements, the mortar used in building the invert shall be composed of equal parts of cement and sand mixed and used as above specified.

The mortar used in laying pipe Sewers shall be of pure cement mixed and used as above specified, all to be furnished by the Contractor without extra charge.

CENTERING AND PATTERNS.

The centering patterns and templets necessary in the construction of the work, are to be furnished by the Contractor, at his own expense, in accordance with plans and directions given. They are to be so made as not to yield under any pressure to which they may be subjected.

MASONRY.

The bricks must be clean and thoroughly wet before being laid. The most perfectly formed bricks, and those with the cleanest surfaces, are to be used

in the inside courses of the invert, the smoothest edge of the bricks being laid to the face.

The bricks in each ring or shell of the invert are to be laid fair and true by line, and to the exact form of the Sewer. In each course, of both invert and arch, they are to be all stretchers, and to break joints with those in the preceding course. The courses are to be carried successively through from end to end of the length in hand. And in no case, in the invert, is the length to be laid in sections. Each brick is to be laid in full mortar, and all joints filled by pressing the brick into the mortar, and never is the mortar to be worked in between the brick.

The face joints are not to exceed one-quarter of an inch; and the collar joints not to be less than half an inch in thickness.

The mortar joints on the inside of the Sewers, below the center line, are to be carefully struck when laid, and those above to be scraped smooth with the bricks immediately after the centers

sre struck. The refuse is to be scraped off and removed entirely from the Sewer before it has time to harden.

MANHOLES.

All manholes are to be circular in section and three feet internal diameter. They are to be built with two rings of brick, giving a thickness of eight inches to the wall. The bricks in the inside ring are to be set vertically. The outer ring is to be built of bats as far as the broken brick on hand will go, otherwise whole bricks are to be used, set as the inside ring, and breaking joints herewith.

On unpaved streets, the tops of the manhole covers to be built to the surface of the streets, on paved streets, one inch lower.

The top course in each manhole is in all cases to be made of whole brick, laid as headers.

On Sewers less than three feet internal diameter, the manholes are to have solid foundations of brick, begun twelve inches below the grade of the Sewer, as shown on plans.

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CATCH BASINS.

All catch basins shall be cylindrical in shape six (6) feet and six (6) inches deep, and four (4) feet inside diameter at the bottom to a height of three (3) feet nine (9) inches and thence to narrow to two (2) feet inside diameter at the top, the walls to be eight inches thick, built of two (2) courses of sewer brick placed edgewise in perpendicular courses resting on a solid bottom of sewer brick placed flatwise and laid in cement. Each catch basin shall be provided with a suburban round iron catch basin cover.

COVERS.

All covers shall be of good quality of cast iron, smooth and free from all defects in casting. A cover and lid shall weigh not less than 470 pounds and shall be of the same size and pattern as iron covers now in use by the Village of _____.

OUTLETS.

The outlets for main Sewers are to be built in accordance with plans and specifications supplied for each case. The terminations or intersections of sub-mains and laterals with main and sub-mains respectively, are to be made through brick or iron pipe junctions preciously built. If for any cause the junction previously made in the Sewer, with which the contractor is to connect, is to be changed in size or position, or a new one is to be built, the contractor is, without extra price, to furnish all materials, to do all the necessary excavation, or labor of any kind growing out of said change.

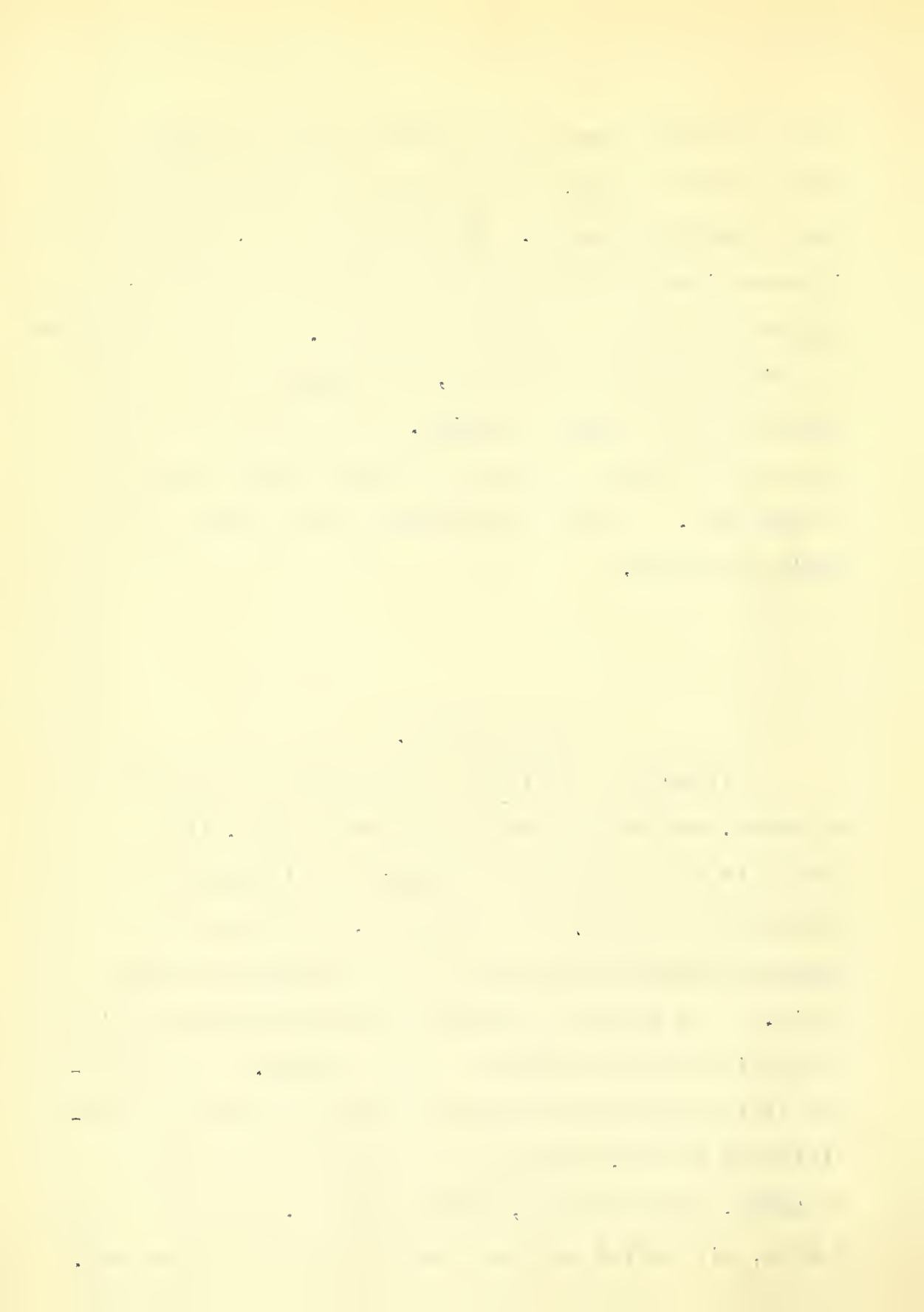
SIDE JUNCTIONS.

Intersections or entrance for laterals swers, whether of brick or pipe, and all junctions of street drains are to be built into the Sewers at such places as shown on plans, junctions for house drains to com-

mence ten feet from street corners and to be placed thence 25 feet apart through the blocks in a thorough and workmanlike manner. Wherever required, the brick intersections are to be strengthened by backing up the angles with walls or piers of masonry. The junctions are to be bricked off at their ends, thoroughly closing them against sand or other material. The pipe junctions are to be closed by laying the brick against the end of the pipe. In no case are the brick to be placed inside the pipe.

BACK FILLING.

After the arching is completed on any length of sewer, and before the centers are struck, the trench is to be filled to a height of at least six inches above the crown of the arch, by thorough ramming wherever the ground is of a nature to admit of it. As soon as possible thereafter the trench is to be filled to the surface of the ground. The sheeting is in no case to be drawn before the trench is sufficiently filled, to prevent the liability of injury to banks, road surfaces, adjacent pipes, railroad tracks, side walks or other property public or private.



In all streets or parts of streets that are paved, graveled, macademized, cindered, planked or covered with any material other than natural ground, all the back-filling is to be well rammed with suitable tools in layers not exceeding six inches in depth, provided the ground is clay, stiff loam or any variety of tenacious nature. If the ground is sand or gravel, the back-filling is to be puddled in such manner as directed.

After being puddled or rammed to the required height, as specified, the paving, of whatever variety, is to be repaired carefully and thoroughly in a manner adapted to its peculiar character in each case, and to the satisfaction of said Board of Local Improvements.

The surplus material taken from the trench is to be removed entirely from the street, or disposed of in such manner as directed, so as to save the village from all danger or expense on account thereof.

REIGN OF KING CHARLES THE FIRST

IN THE YEAR 1649

BY JOHN BURNET

IN TWO VOLUMES

(THE SECOND VOLUME)

AND THE HISTORY OF THE

REIGN OF KING CHARLES THE SECOND

IN

THE YEAR 1685

BY JOHN BURNET

IN TWO VOLUMES

(THE SECOND VOLUME)

AND THE HISTORY OF THE

REIGN OF KING CHARLES THE SECOND

IN THE YEAR 1685

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(THE SECOND VOLUME)

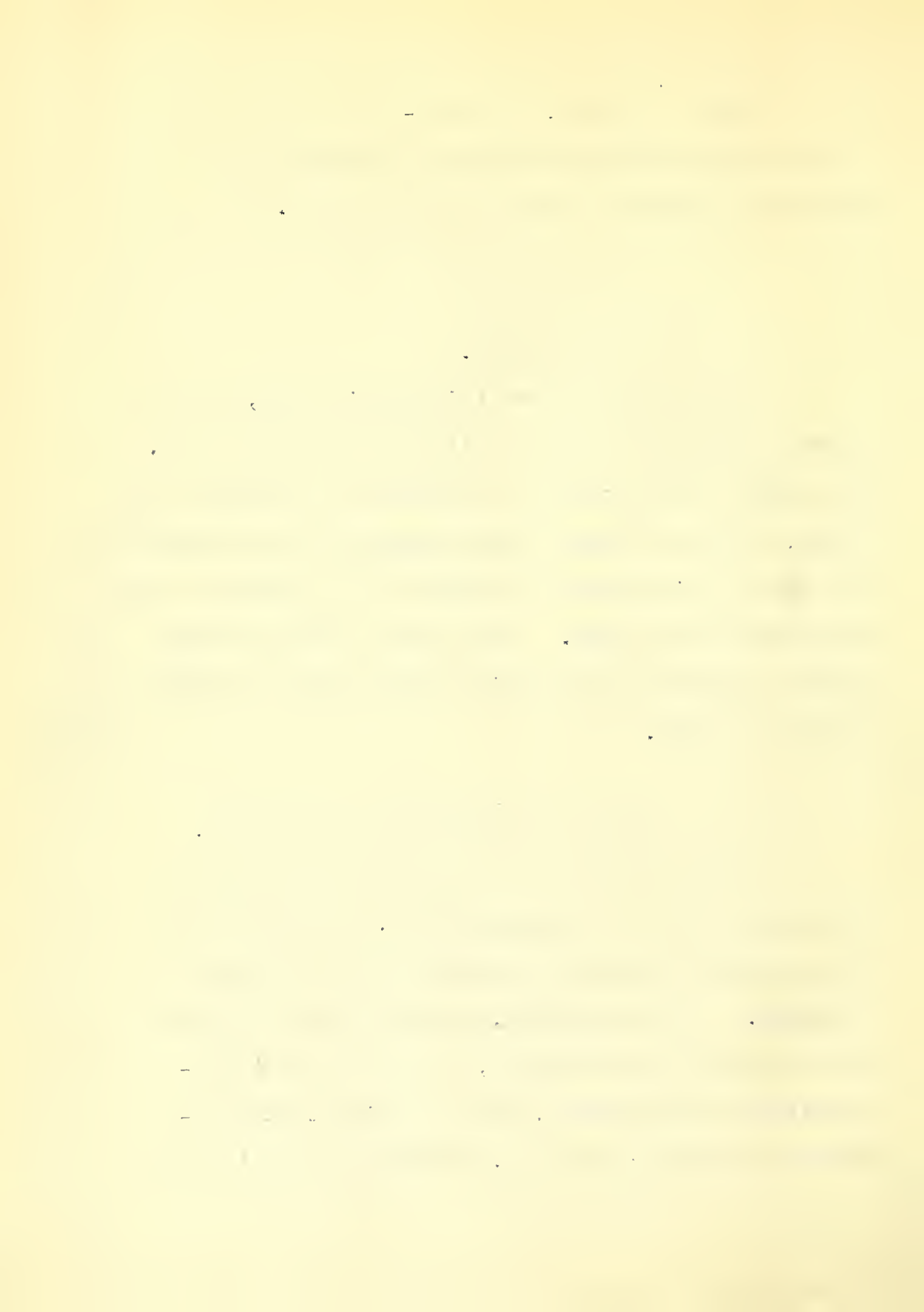
Where required, the back-filling shall not be left unfinished more than one hundred feet behind the completed masonry or pipe work.

PIPE LAYING.

Each pipe is to be laid on firm bed, and in perfect conformity with the lines and levels given. The ends of the pipes are to abut close against each other, in such a manner that there shall be no shoulder or want of uniformity of surface on the bottom of the interior of the drain. Each joint shall be wiped clean of mortar on the inside before another length of pipe is laid.

SPECIAL AND GENERAL REQUIREMENTS.

The Contractor will be required to employ a sufficient number of competent men, and furnish all the material necessary to carry on the work with dispatch. If at any time, in the opinion of the Board of Local Improvements, the work is not progressing satisfactorily, they may direct the Contractor to employ more men, and should he fail to do



after reasonable notice, then the Board of Local Improvements may employ such additional help and furnish such additional material as is, in their judgment, necessary for the completion of the contract in the time specified, and deduct the expense thus incurred from any money due the Contractor at the time of final settlement.

The sewers, after completion, are to be left entirely clear of rubbish of every kind and description. The dead ends are to be carefully closed with brick and mortar, so as to exclude all running sand and other material.

The village reserves the right to connect the house and lot, or street drains with any of the sewers embraced in these specifications, as soon as the Board of Local Improvements may deem it expedient, but the making of any such connection shall not be deemed an acceptance of said sewer.

The said Board of Local Improvements must be permitted to remove such portions of the work as it

may from time to time think necessary, for the discovery of improper materials or workmanship: and the Contractor shall restore such work at his own expense, in case it shall have been done improperly, and at the expense of the village if done in a proper manner.

The Contractor will be required to guard the public effectually from liability to accident in consequence of his operations, during the whole progress of the work, both by night and by day, and will be held responsible for any damages the village may have to pay in consequence of neglect on the part of the Contractor to protect the public against such accident.

The contractor will also be held responsible for all damages said village may have to pay to private individuals or corporations, in consequence of any of the acts or doings, or neglects of said Contractor or any of his employes in connection with said work. In addition to the necessary barriers, a red light must be maintained at night at each end of the trench.



The Contractor will be required to dismiss from his employment all incompetent and unfaithful persons; also to keep in perfect repair for six months after its completion, the whole of his work, except where the repairs may be rendered necessary by causes clearly beyond his control.

Whatever precaution unforeseen circumstances may render necessary in the judgment of the Board of Local Improvements in order to make the sewers both unyielding and impervious, shall be taken ; and all extra work or materials rendered necessary thereby, which may be ordered by the said Board shall be paid for at a fair estimate.

The Contractor will be required to provide all stakes, dig all stake holes necessary to give the lines and levels for the work, in time for the visit of the Board of Local Improvements or Village Engineer, at such times as it or he may appoint. All railroads and tracks of any kind not required to be taken up must be kept in constant running order and they must be left, after the completion

of the work, in as good condition as they were before its commencement by the Contractor. No allowance will be made for delays, or other damages, occasioned by the necessity of keeping the railroads or street car tracks in constant running order, or for removing and replacing same, when it is necessary to do so.

No claims for extra labor, or materials furnished by the Contractor will be allowed unless ordered by resolution by said Board of Local Improvements, and all claims for damages for any cause whatsoever, must be reported to the Inspector on the work at the time that such damages occur; and such claims must be presented to said Board of Local Improvements, at the end of the same month by the Contractor, otherwise the village will not be bound to pay any such claims.

Water used from the village water pipes by the Contractor in the construction of work, will have to be paid for by him at the usual rates, said rates being based upon the amount of brick and mortar used in the construction of the work. The Contractors will not be allowed to draw any water from the public fire

hydrants, except by a special permit and license issued therefor by the proper village official. In case the Contractor obtains his water from some other source he is to call the attention of the Inspector to the fact at the time.

If, for any cause, the Board of Local Improvements finds it necessary or desirable to suspend operations for any considerable time, it is to be done by the Contractor on due notification; and he will not be entitled to any damages, of any kind or nature whatsoever, because of such detention. He will, however, be allowed further time in the completion of his contract, equal to the delay caused by the suspension of the work.

Any Contractor who shall fail to employ a sufficient force of competent men to complete the work he undertakes by the time specified, may be dismissed by said Board of Local Improvements, who shall be, in such case, authorized to complete said work at the cost of the Contractor.

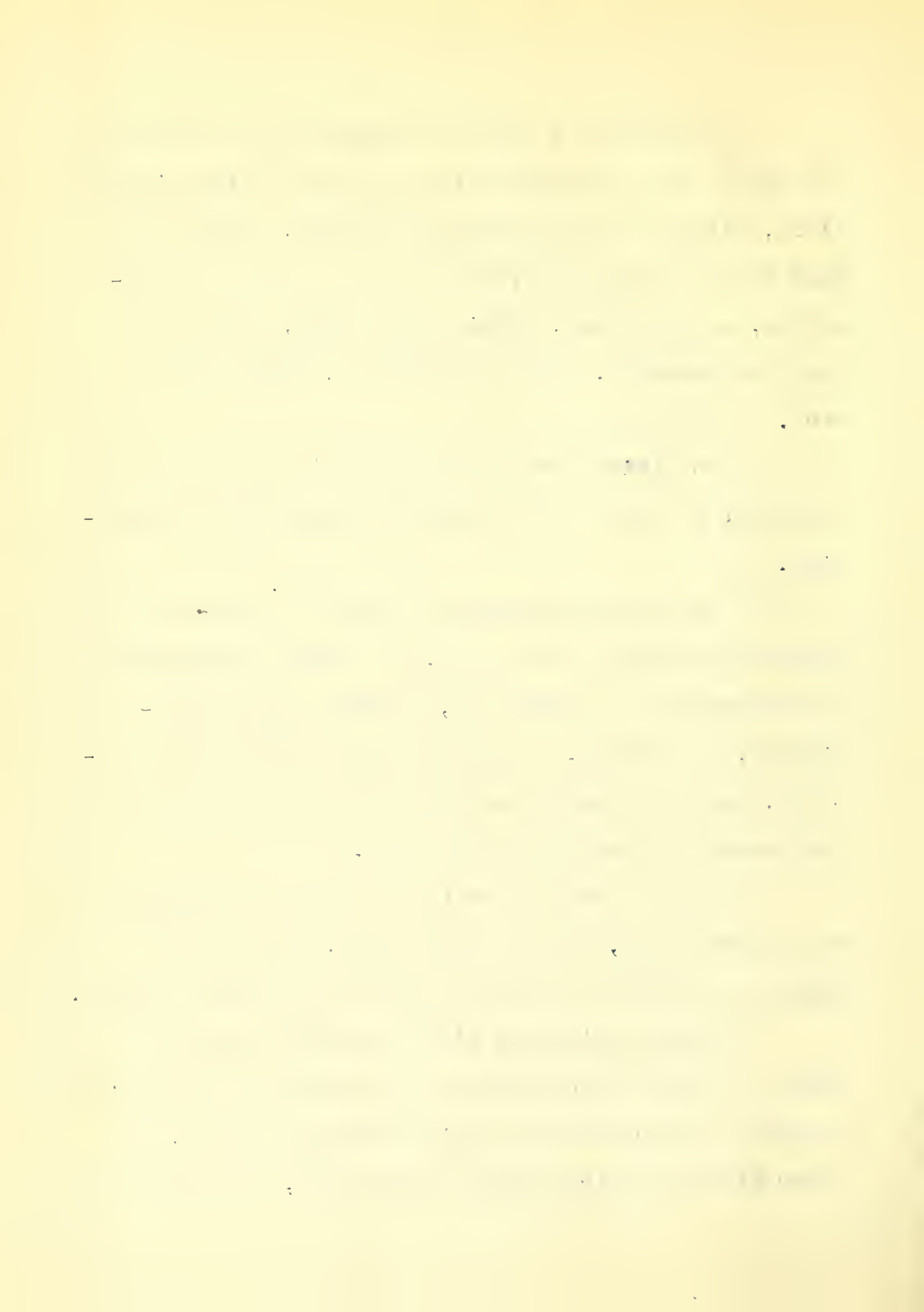
Any bidder to whom a contract may be awarded who shall fail to appear at the office of the Village Clerk, either in person or by his agent, within two days after being addressed through _____ post-office, or shall not, within three days, furnish the required security, shall forfeit his claim to the work.

The ~~said~~ Board of Local Improvements reserves the right to reject any proposal or bid at its discretion.

No Contractor will be allowed to sub-let the whole or any part of his work, or make an assignment of the moneys to be paid him, without special permission, in writing, from said Board of Local Improvements, and each Contractor will be required to give his personal attention to the work.

All of the work to be commenced and carried on at such times, and in such places, and in such manner as the Board of Local Improvements shall direct.

Monthly estimates will be made by the said Board of Local Improvements, of the value of the work actually constructed and in its permanent place, and on or about the first day of each month, vouchers for



eighty per cent of the estimated value of the work done the previous month will be issued, the remaining twenty percent to be reserved until the completion of the whole work.

The Village by its Board of Local Improvements reserves the right to make any changes in the foregoing plans and specifications, that the said Board of Local Improvements may deem desirable for necessary; and the Contractor shall furnish any additional materials, and do any additional work required by such changes, at the rates said Board of Local Improvements shall determine to be just.

The Village by its Board of Local Improvements reserves the right to refuse to issue a voucher and to direct that no payment shall be made to the Contractor, in case the Board of Local Improvements has reason to believe that the said Contractor has neglected, or failed to pay any sub-contractor, workman, or employe for work performed on or about any of the sewers included in these specifications, until said

Board of Local Improvements is satisfied that such sub-contractor, workman or employe has been fully paid.

After the completion of the work, to the satisfaction of the Board of Local Improvements, the village reserves the right to refuse payment of the twenty percent reserved, or any amount due said Contractor for said work, until satisfied that all sub-contractors, workmen, or employes of the said Contractor have been fully paid.

The Village by its Board of Local Improvements also reserves all right, after ten days' notification to said Contractor, to apply all moneys due, or that may become due, under the contract for the sewers included in these specifications, to the payment of such sub-contractors, workmen, or employes of said contractor, without further notice to him of the intention to do so.

All work included in this contract is to be completed on or before _____.

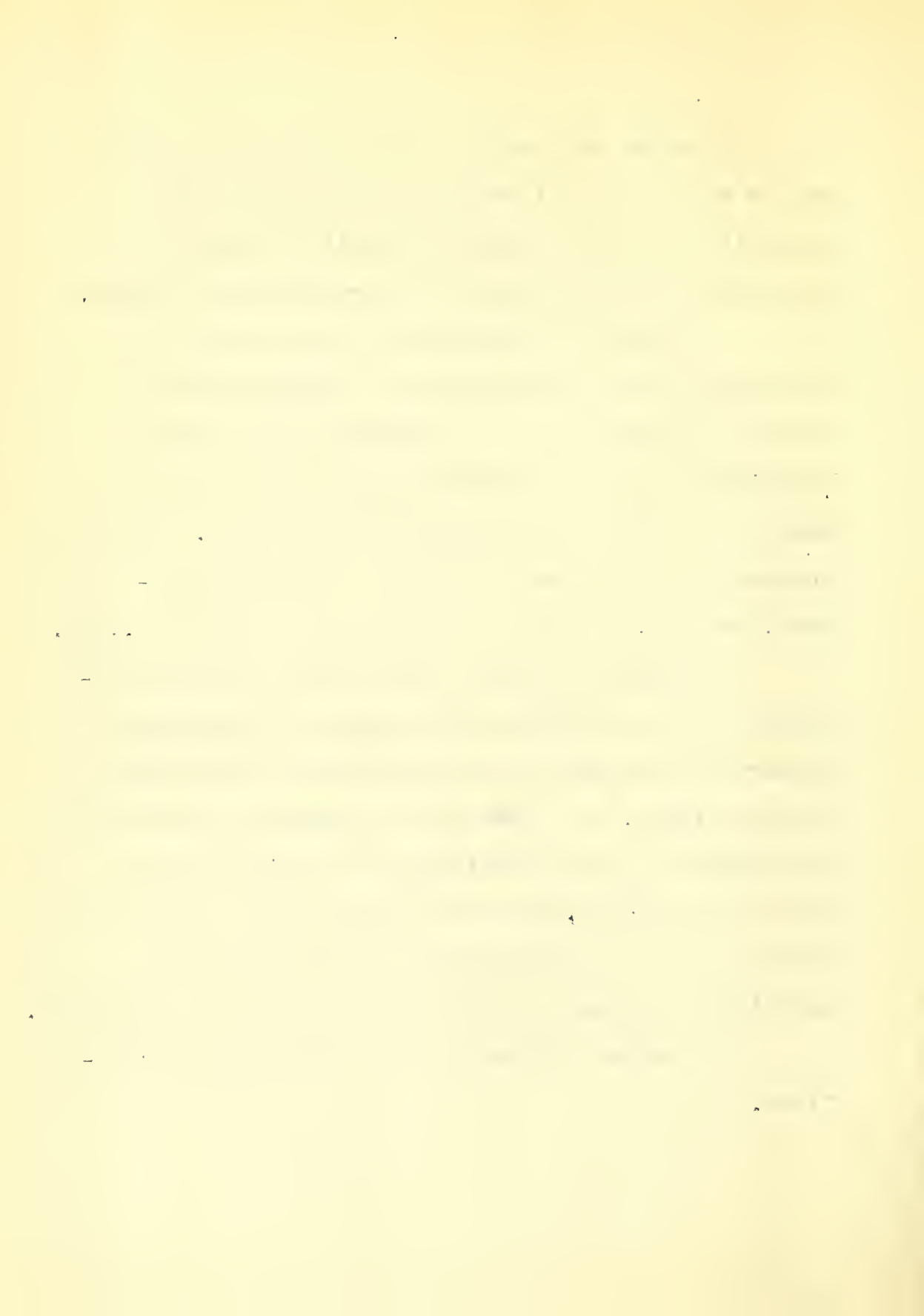
Parties bidding for the work must do so in accordance with a form of proposal furnished by the said Board of Local Improvements.

The actual length of each sewer to be built may be more or less than the corresponding length given in the proposal and the specifications; but no variation will be made in the rate on that amount.

No claims for an amount of money beyond the contract price for the work will be entertained or allowed on account of the character of the ground in which the trench or other excavations are made except for rock cutting heretofore specified. The Contractor must assume the risk of meeting quicksand, rubbish, railroad and street car tracks etc., etc.

Anything omitted in these specifications necessary to fully complete the sewers in workmanlike manner shall be done by the Contractor without cost to the Village. All work must be done and all material furnished to the satisfaction of the said Board of Local Improvements, and the determination of the said Board of Local Improvements as to said work and materials shall be and is conclusive upon the Contractor.

No extras will be allowed for hardpan excavations.



Inspectors will be appointed whose duty it shall be to point out to the Contractor any neglect or disregard of these specifications, but the right of final acceptance or condemnation of the work will not be waived at any time during its progress.

Ordinarily one Inspector will be employed on each improvement under contract but if on account of any disregard of these specifications on the part of the Contractor additional Inspectors should be required such additional Inspectors shall be employed by the Board of Local Improvements as it may deem necessary to insure faithful compliance with the contract, and the pay of such additional inspection shall be charged to the Contractor at the rate of \$3.50 per day and deducted from the amount due him for final settlement. In case the work is not completed at the time contracted for all charges for inspection from and after such time shall be paid by the Contractor and the same deducted at the time of final settlement.

All loss or damage arising out of the nature of the work to be done or from any detention or unforeseen obstruction or difficulties which may be encountered in the prosecution of the work, or from the action of the elements shall be sustained by the Contractor,

who will be required without cost to the Village of _____ to replace all pavements, sidewalks, or crosswalks displaced or injured, and to remove from the street all surplus materials, earth, rubbish etc., immediately after the completion of the work.

Upon the questions concerning the execution of the work in accordance with these specifications and the measurement thereof, the decision of the Board of Local Improvements shall be final.

The sum of _____ will be withheld for a period of _____ from and after the date of final acceptance of the work, to be paid to the Contractor at the expiration of such time less the amount which may be expended by the Village of _____ in the refilling of trenches, through the neglect to do so by the Contractor within 5 days of the time of being notified by the Board of Local Improvements that such refilling is necessary.

B O N D

KNOW ALL MEN BY THESE PRESENTS, That we

are held and firmly bound unto the Town of _____

_____, in the sum of _____ Dollars,

lawful money of the United States of America, to be

paid to the said Town of _____

or to its certain attorneys or assigns, to which

payment, well and truly made, we bind ourselves, our

heirs, executors and administrators, and each and every

one of them, firmly by these presents.

Signed and sealed with our seals, and dated

at _____, this _____

day of _____ 19_____.

THE CONDITION OF THIS OBLIGATION IS SUCH

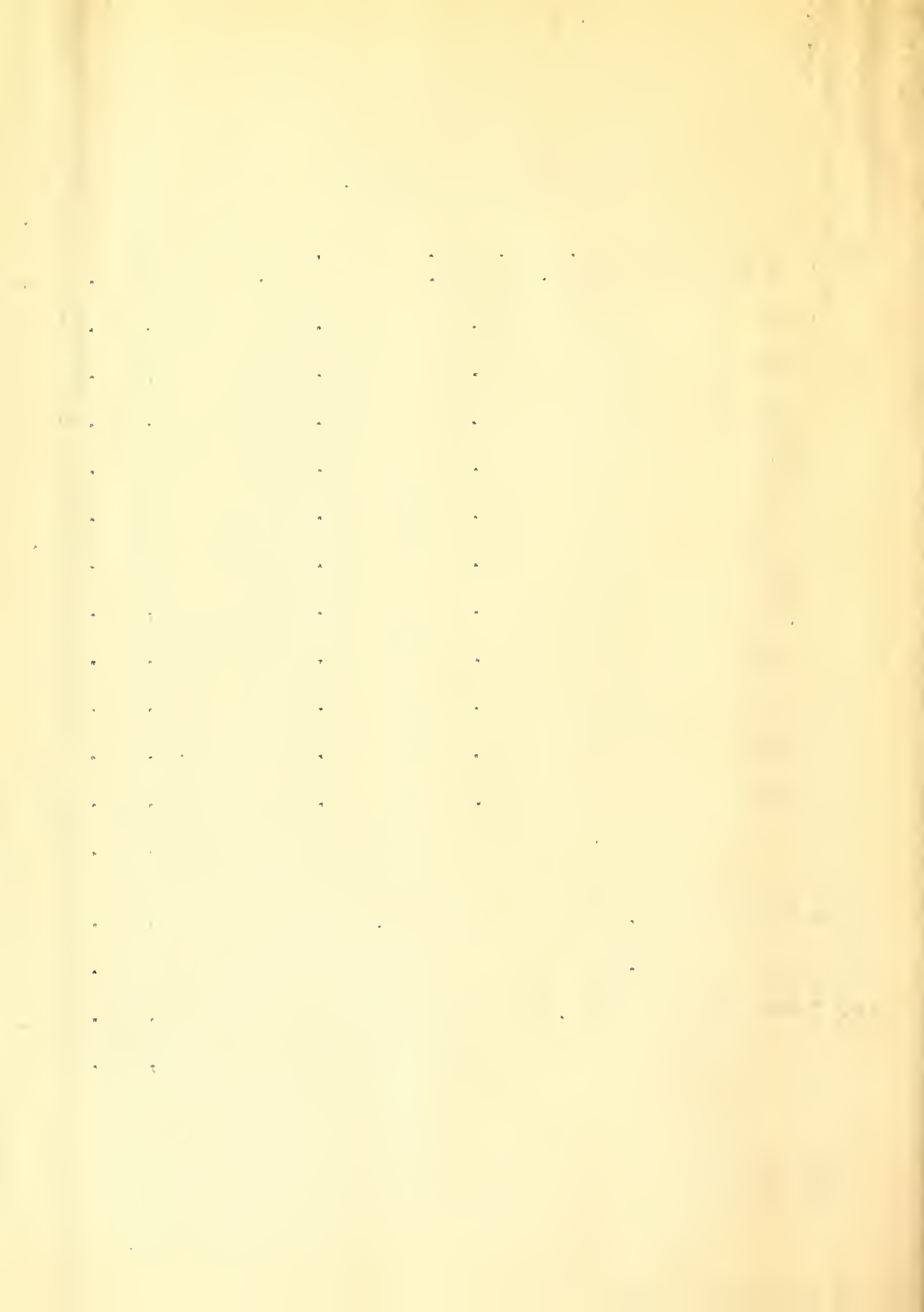
That Whereas, the said
..... has entered into a contract with
the Town of bearing date the
..... day of 19....., which
said contract is hereunto attached.

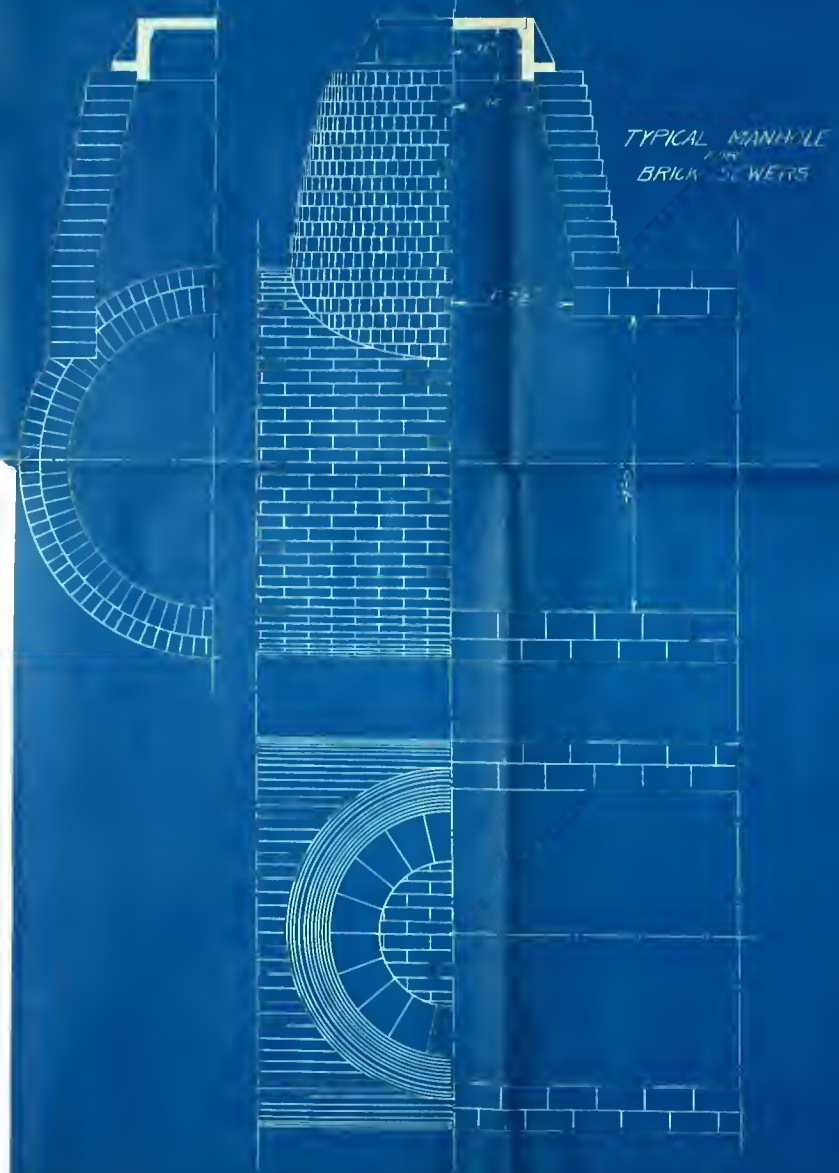
NOW, WHEREFORE, If the said
shall well and truly keep and perform all the terms
and conditions of said contract, on part
to be kept and performed, and shall indemnify and save
harmless the said Town of as
herein stipulated, then this obligation shall be of
no effect, but otherwise it shall remain in full force
and virtue.

.....
.....
.....

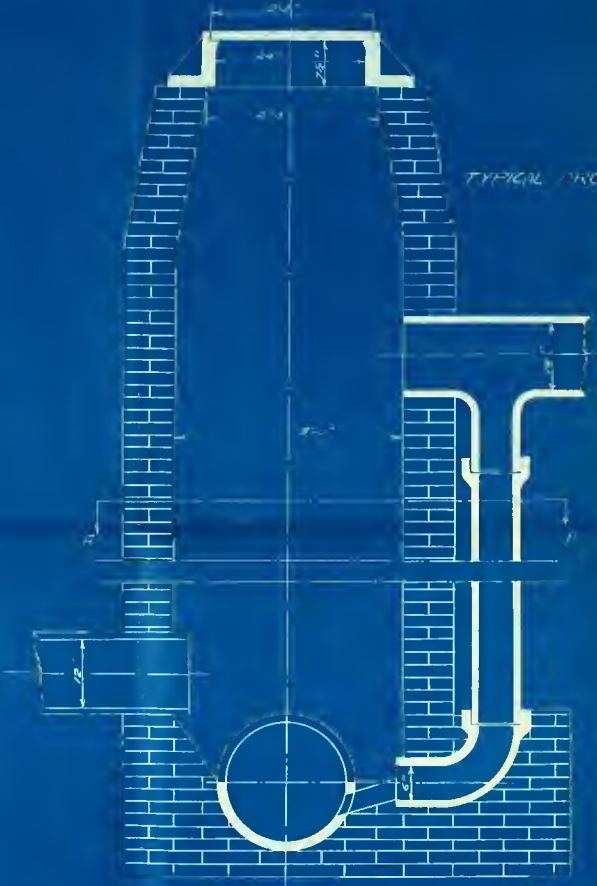
ESTIMATE OF COST.

Length of pipe in feet	Diam. Sewer.	Av. Cut. feet.	Cost. per ft.	Total Cost.
15326	12"	9.8	\$.89	13,640.14
2885	15	8.8	1.04	3,000.40
2660	18	6.0	1.20	3,192.00
1210	20	7.0	1.45	1,754.50
385	22	11.0	1.63	627.55
385	24	10.6	1.95	750.75
415	30	12.1	2.44	1,012.60
415	33	13.9	3.60	1,494.00
3130	36m	13.0	4.08	12,770.00
1330	42	9.0	4.05	5,376.50
1800	48	3.7	4.25	<u>7,650.00</u>
Total				51,268.44
84 Manholes @ \$35.00				2,940.00
18 " 20.00				360.00
190 Catch Basins @ \$25.00				<u>4,750.00</u>
Grand Total				59,318.44

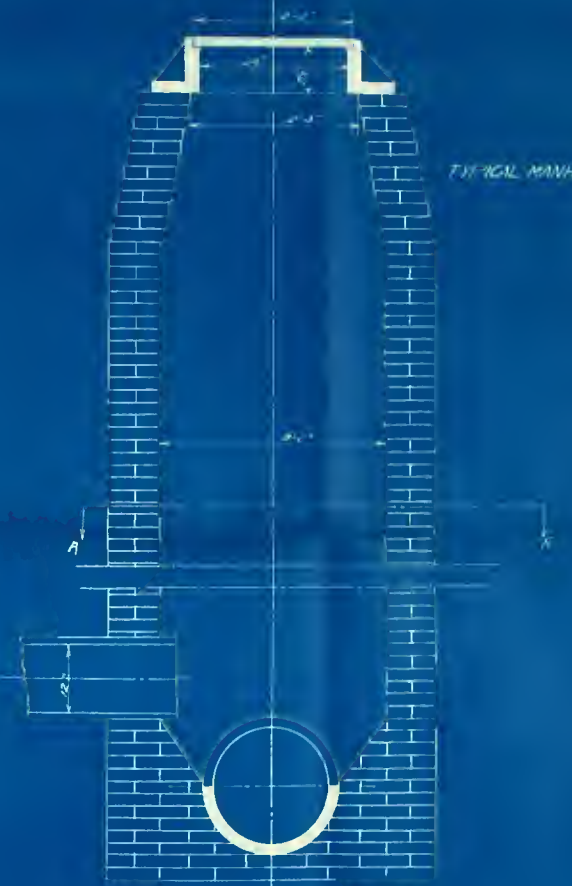




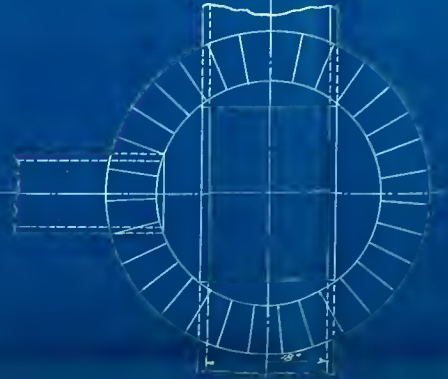
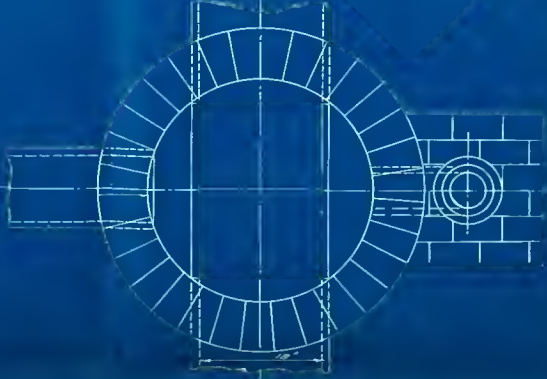
TYPICAL MANHOLE
FOR
BRICK SEWERS



TYPICAL BRICK MANHOLE



TYPICAL MANHOLE



THESIS

Young, H. H.
Aug. 1911

STREET	FROM
SUMNER	SECOND
"	FIRST
LINCOLN	200'S and 2nd
"	WASHINGTON
"	FIRST
CRAWFORD	WASHINGTON
	FIRST
	CONRAD
NORTH	W.L. & FRW

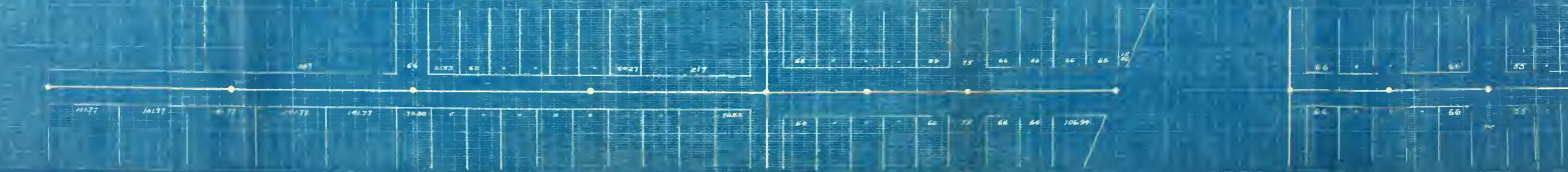
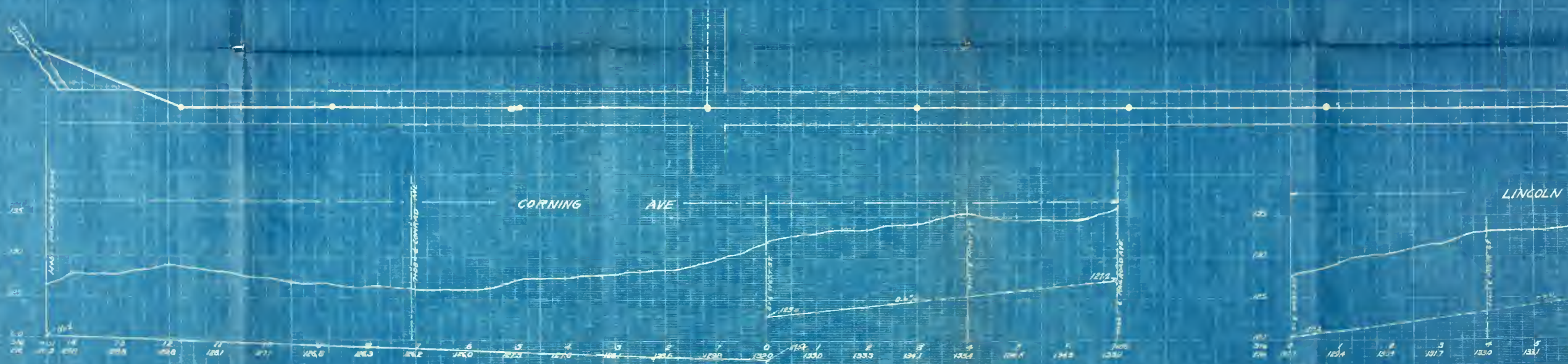
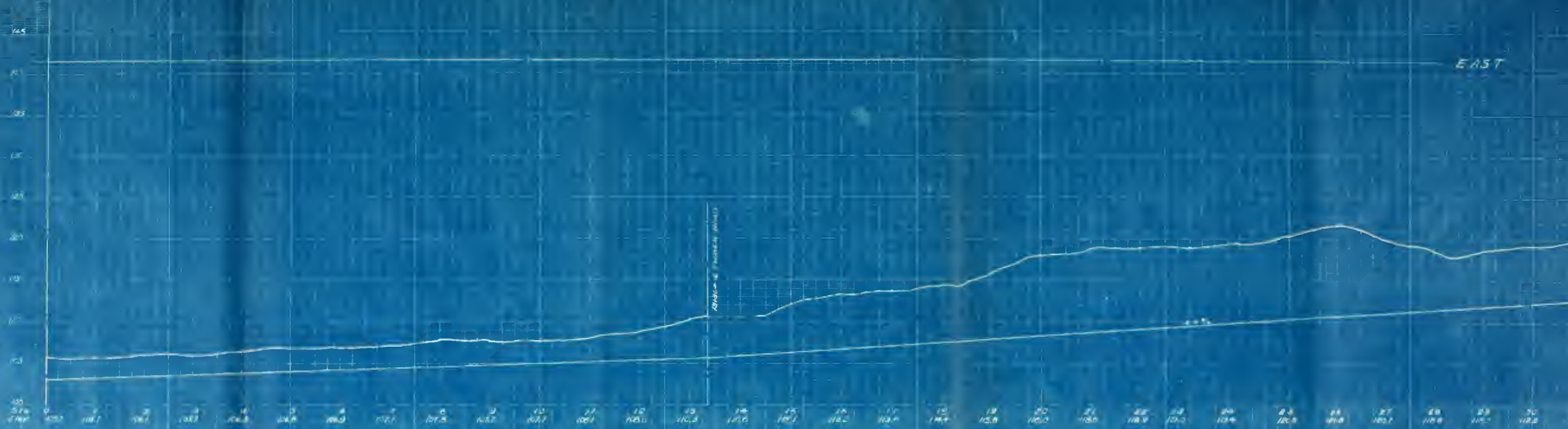
PEOTONE SEWER SYSTEM RESULTS

THESIS

STREET	FROM	TO	ACRES TRIBUTARY	CU. FT. SEC.	GRADE %	VELOCITY	PIPE SIZE	LENGTH	AV. CUT IN FT.	NO OF HOUSE CONN.	NO OF MANHOLES	NO OF CATCH BASINS
JUNIOR	SECOND	FIRST	12.53	313	0.8	3.8	12"	440'	6.9	12	2	7
"	FIRST	WEST	16.33	408	0.8	3.9	15"	400'	6.9	10	2	0
LINCOLN	200'S on 2nd	LINCOLN	1.9	46	1.0	2.5	12"	200'	8.0	4	1	0
"	WASHINGTON	FIRST	7.51	188	0.4	2.6	12"	400'	8.7	24	4	10
"	FIRST	WEST	13.21	330	0.8	3.8	12"	800'	8.7	10	2	2
CRAWFORD	WASHINGTON	FIRST	5.7	142	0.5	2.7	12"	809'	9.1	18	4	5
"	FIRST	WEST	9.5	237	1.9	4.6	12"	400'	9.1	10	2	6
"	CONRAD	WEST	6.7	170	0.15	2.15	18"	708'	6.7	20	3	5
NORTH	W. of R.W.	SECOND	2.0	1.0	0.6	2.25	12"	250'	12.2	5	1	4
"	SECOND	WEST	16.01	6.55	0.6	4.25	18"	810'	11.3	23	4	6
"	CONRAD	WEST	6.7	1.7	0.05	2.06	18"	708'	6.7	16	3	5
SECOND	CRAWFORD	NORTH	3.9	1.95	0.75	3.0	12"	408'	10.9	10	0	0
"	MAIN	NORTH	4.41	2.20	0.5	3.3	12"	400'	10.9	20	0	0
MAIN	W. of R.W.	WEST	7.45	2.78	0.8	3.4	12"	892'	9.5	26	3	7
CORNING	W. of R.W.	WEST	7.6	1.90	0.6	3.1	12"	706'	9.0	18	5	6
"	PROPERTY LINE	CONRAD	5.62	1.40	0.24	2.03	12"	700'	7.9	20	3	3
"	CONRAD	WEST	14.97	3.74	0.24	2.65	18"	708'	9.9	18	1	4
WEST	SUMNER	LINCOLN	16.33	4.08	0.15	1.90	20"	385'	6.8	-	1	3
"	LINCOLN	CRAWFORD	29.54	7.38	0.15	2.5	22"	385'	11.0	-	1	4
"	CRAWFORD	NORTH	45.74	11.45	0.15	2.66	24"	385'	10.6	5	1	4
"	NORTH	MAIN	61.75	18.00	0.15	3.21	30"	415'	12.1	-	2	5
"	MAIN	CORNING	69.20	20.78	0.15	3.43	33"	410'	14.0	-	1	3
"	CORNING	WILSON	91.77	26.42	0.15	2.94	36" GRK	415'	14.0	-	2	5
"	WILSON	SOUTH	103.03	24.42	0.15	2.94	36"	410'	15.7	-	2	6
"	440'SOUTH SOUTH	SOUTH	34.1	8.5	0.5	2.25	12"	440'	11.0	8	2	1
WILSON	W. of R.W.	WEST	54.7	1.38	1.0	3.25	12"	530'	10.0	14	4	4
SOUTH	WEST	SECOND	106.44	30.27	0.15	3.2	36" GRK	805'	8.9	14	3	4
"	SECOND	FOURTH	114.94	32.37	0.15	3.2	36" GRK	805'	8.9	20	2	0
"	FOURTH	EAST	125.98	34.97	0.15	3.2	36" GRK	694'	8.9	18	1	2
CRAWFORD	ERW of R.W.	EAST	10.8	2.7	0.4	2.75	15"	80	9.0	19	3	6
NORTH	EL. of R.W.	EAST	8.7	2.08	0.4	2.75	12"	1050	9.5	28	3	8
MAIN	EL. of R.W.	FOURTH	4.05	1.01	0.4	2.25	12"	540	9.3	34	4	5
"	FOURTH	EAST	10.3	2.58	1.4	4.5	12"	680	12.65	-	-	4
CORNING	EL. of R.W.	890'E	5.64	1.41	1.3	3.6	12"	890	10.9	18	3	0
"	890'	EAST	12.15	3.02	0.4	3.1	15"	500	7.8	18	1	4
WILSON	EL. of R.W.	THIRD	3.44	8.6	0.8	2.6	12"	512	8.0	12	3	5
FOURTH	WILSON	SOUTH	7.24	18.1	1.7	4.3	12"	400	8.0	10	2	4
SECOND	620'S	SOUTH	4.6	1.13	0.4	2.95	12"	415	10.2	-	-	3
THIRD	1150'S	SOUTH	81.6	20.4	0.6	3.16	12"	620	14.1	16	2	2
"	200'S	MAIN	SPECIAL	-	1.0	-	12"	245'	10.2	-	2	2
EAST	1000N	CRAWFORD	3.5	8.75	0.8	2.75	12"	1000	8.5	-	2	3
"	CRAWFORD	NORTH	14.3	3.57	1.4	4.9	12"	400	11.7	-	1	2
"	NORTH	MAIN	23.0	5.75	1.4	5.5	15"	400	10.8	-	1	2
"	MAIN	CORNING	33.3	8.32	0.6	4.6	18"	425	6.0	-	1	2
"	CORNING	SOUTH	45.45	11.4	0.4	4.3	20"	825	7.2	-	2	3
"	SOUTH	TUCKER	171.43	46.37	0.4	5.05	42" GRK	1330	9.0	-	4	2
"	TUCKER	OUTLET	221.43	58.87	0.2	4.45	48" GRK	1800	3.0	-	4	2

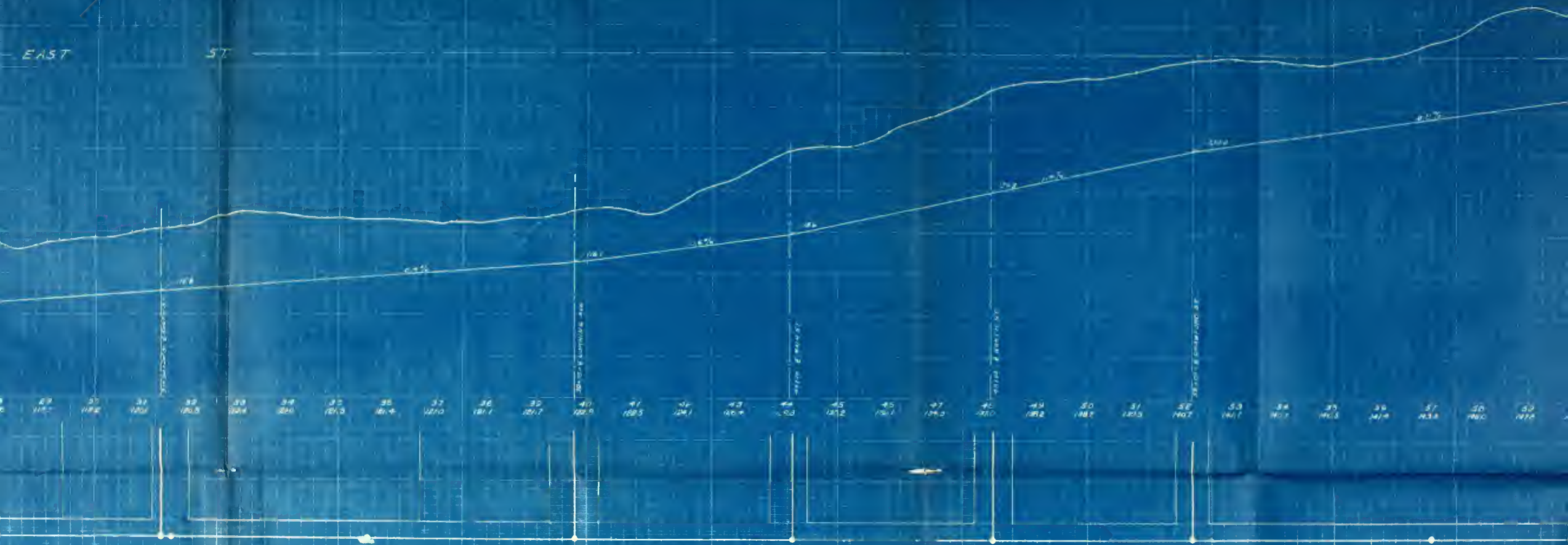
East

EAST

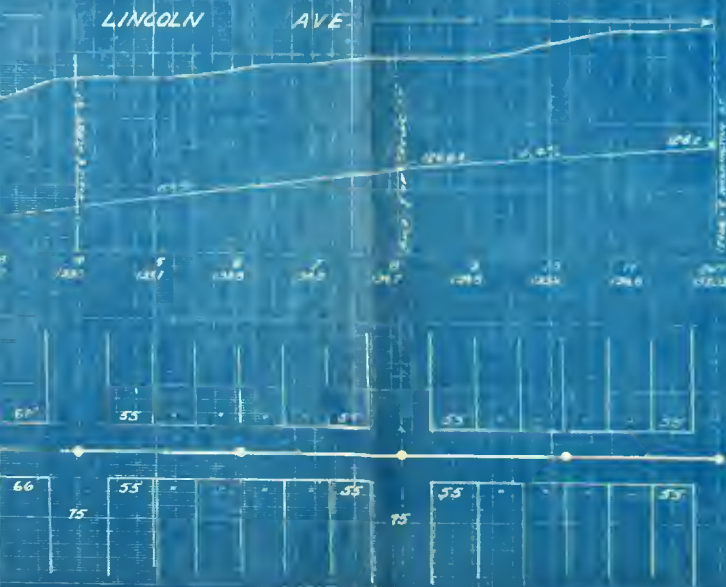


EAST

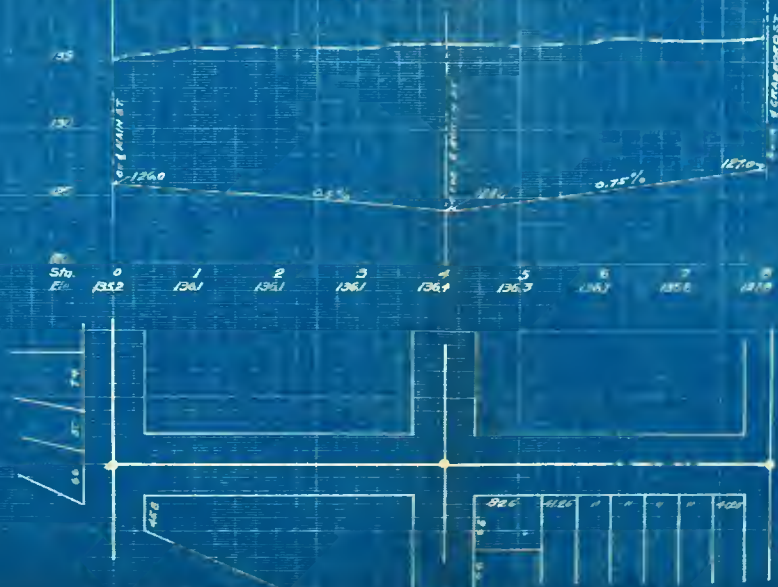
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LINCOLN AVE

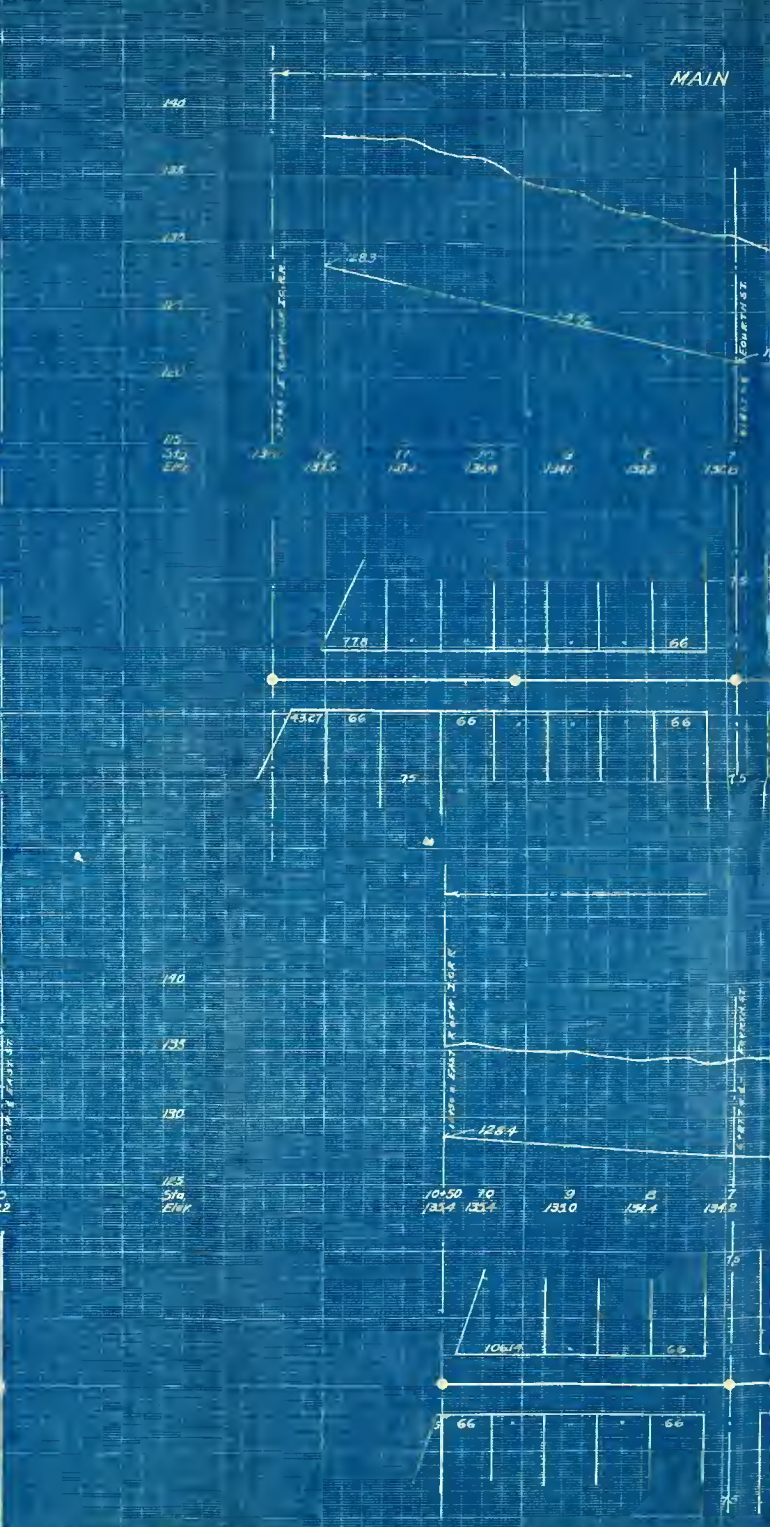
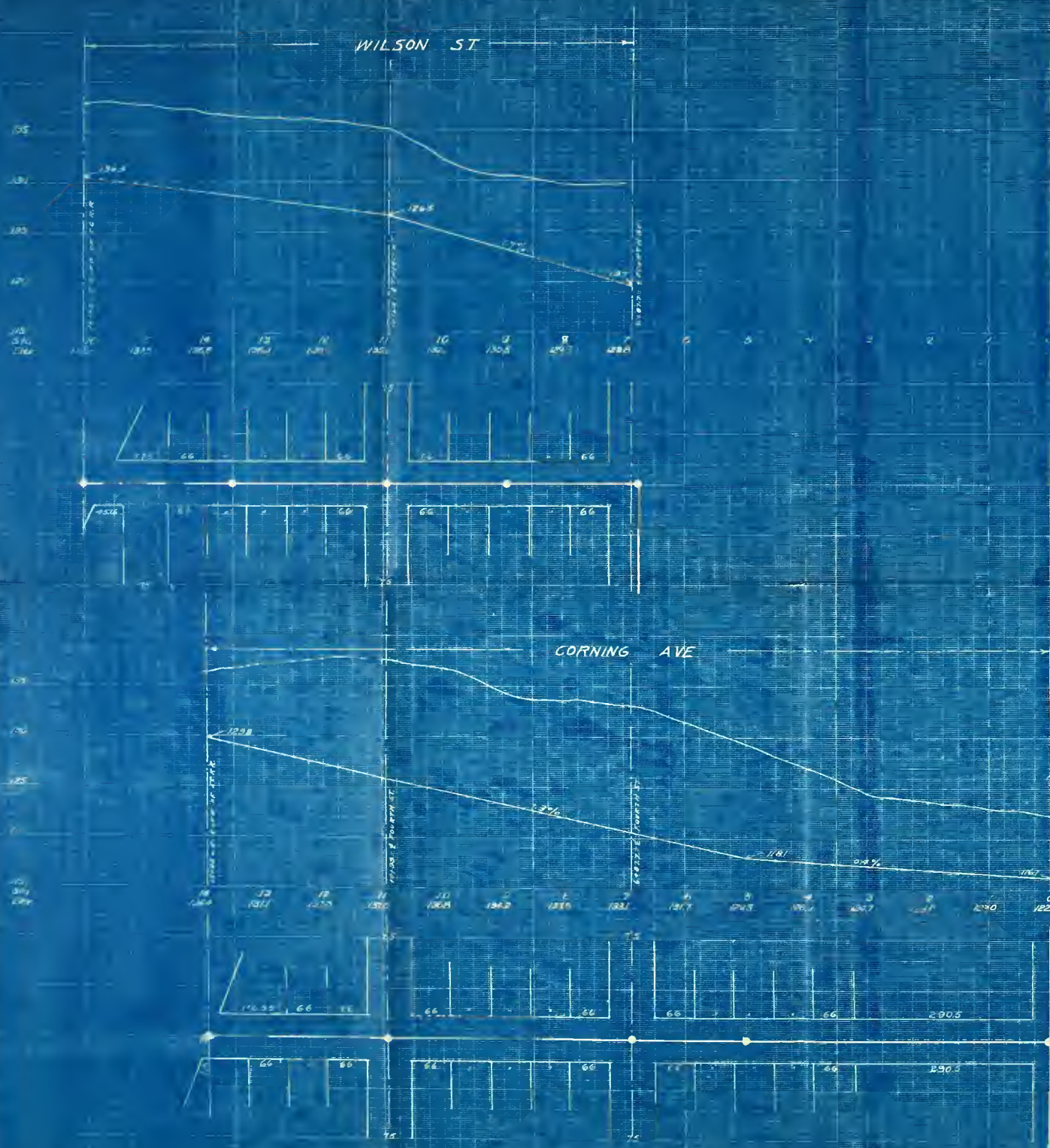


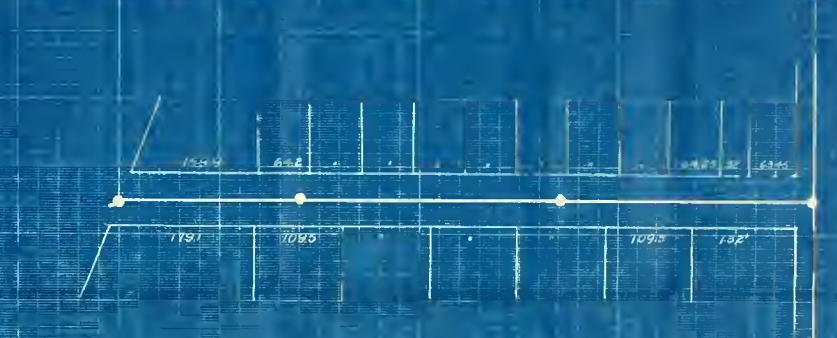
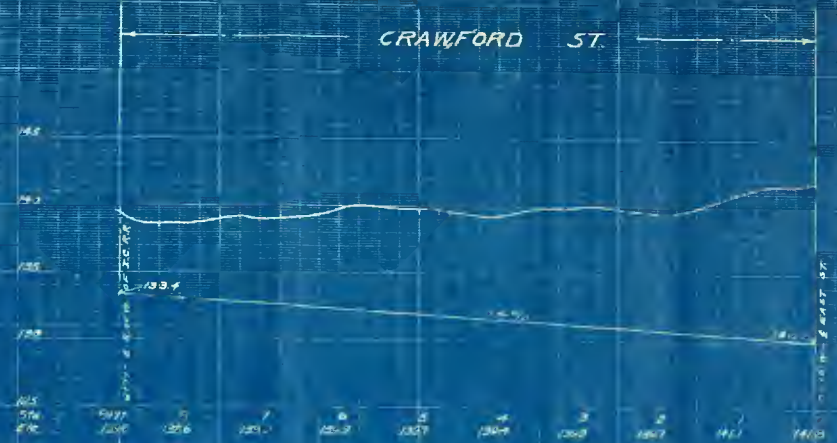
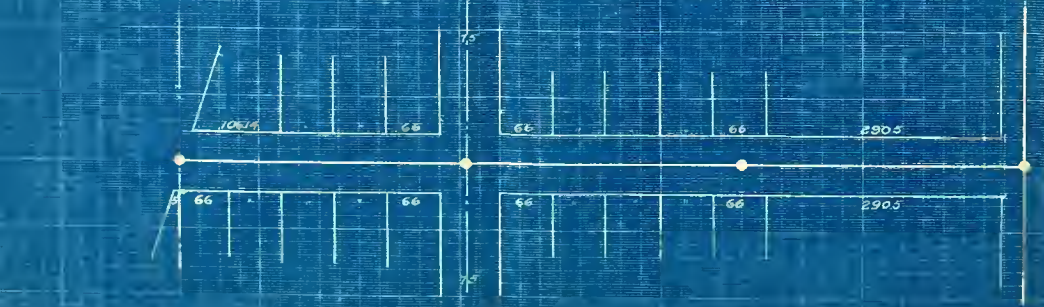
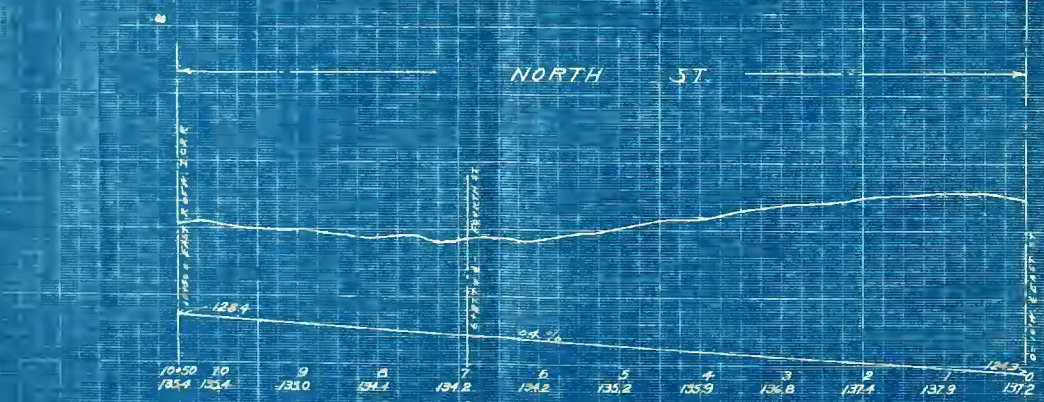
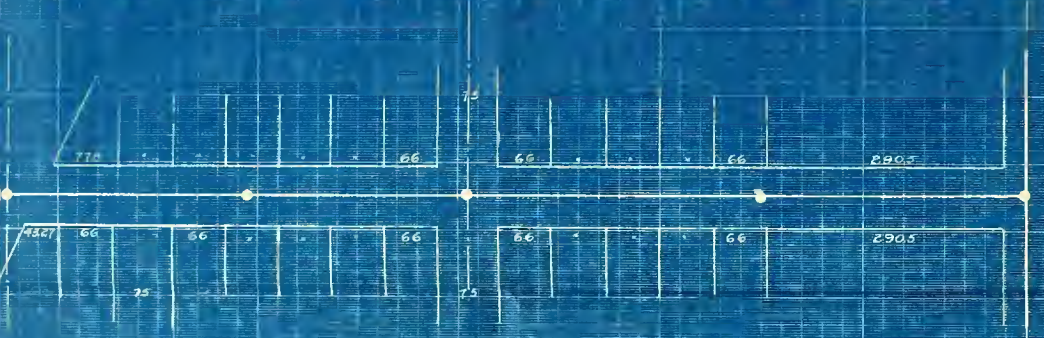
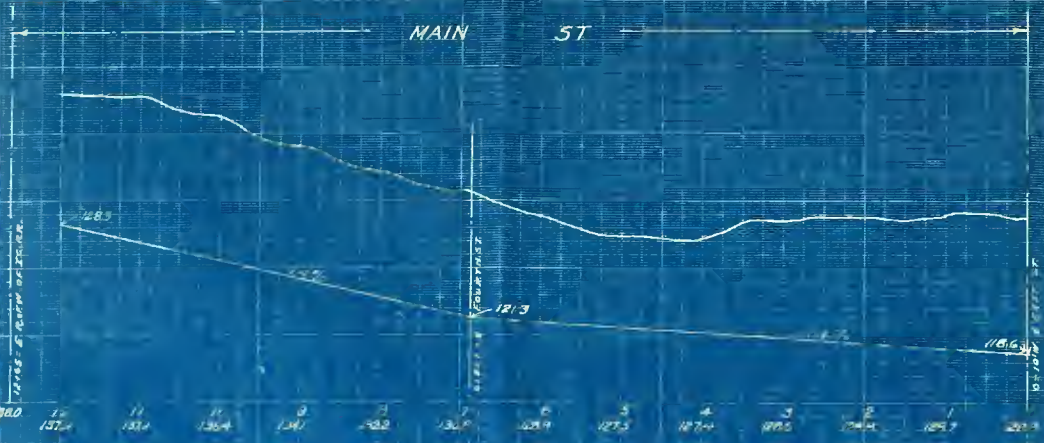
SECOND ST



E on WILSON ST

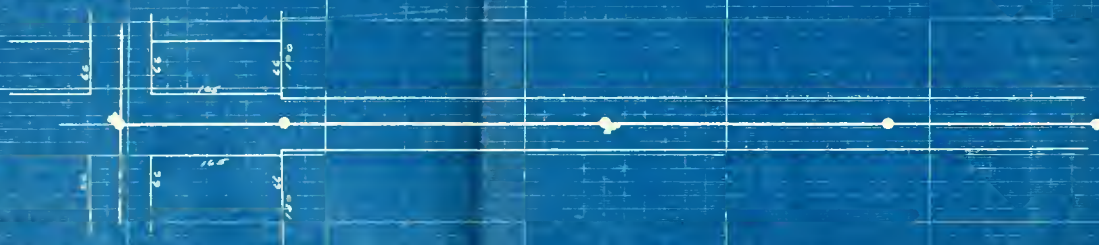
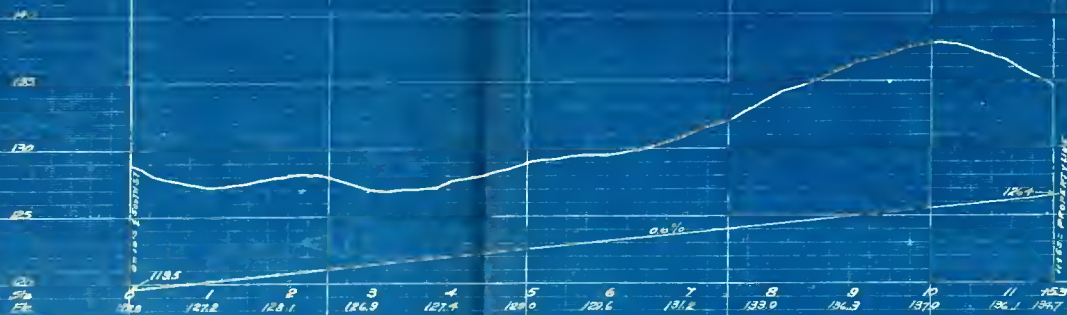




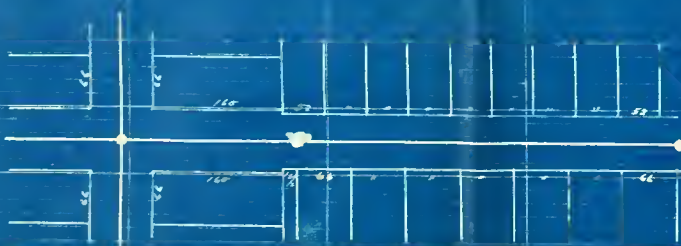
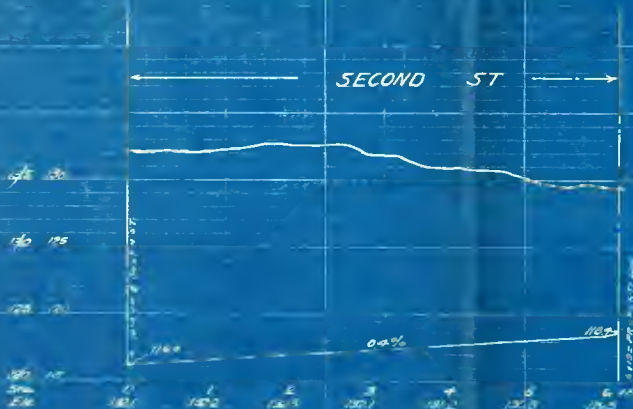


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with

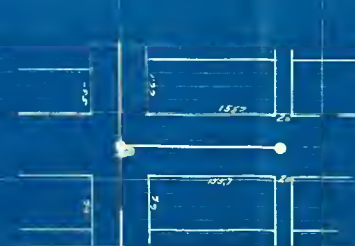
THIRD ST

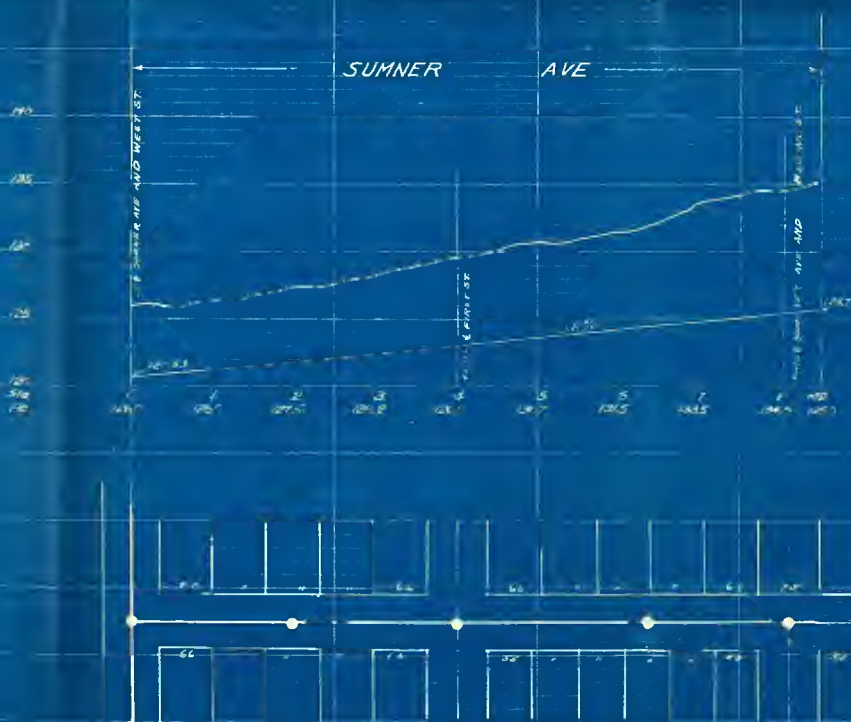
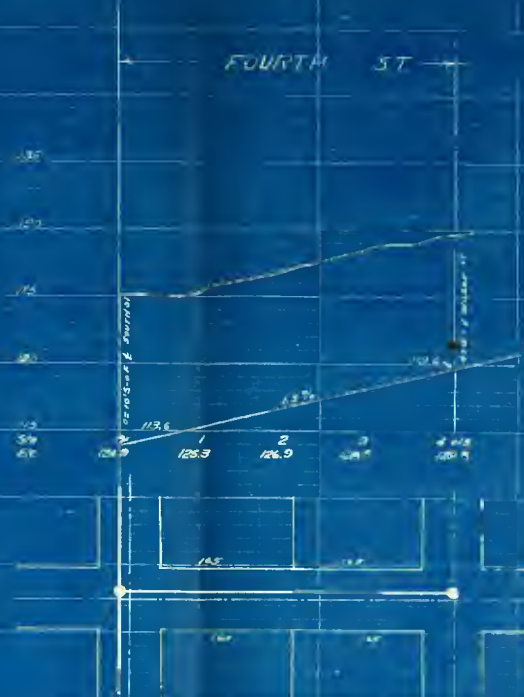
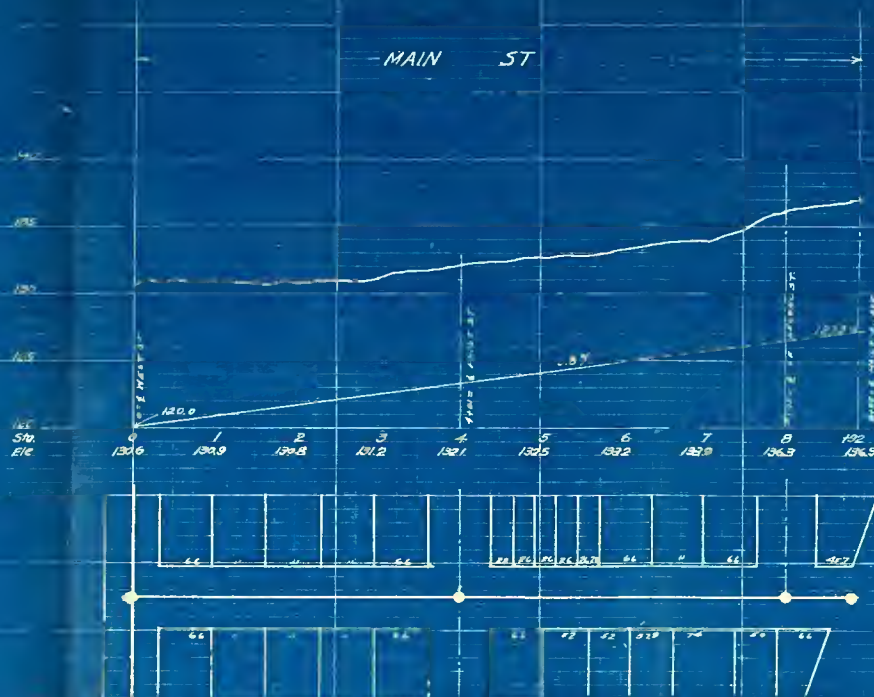


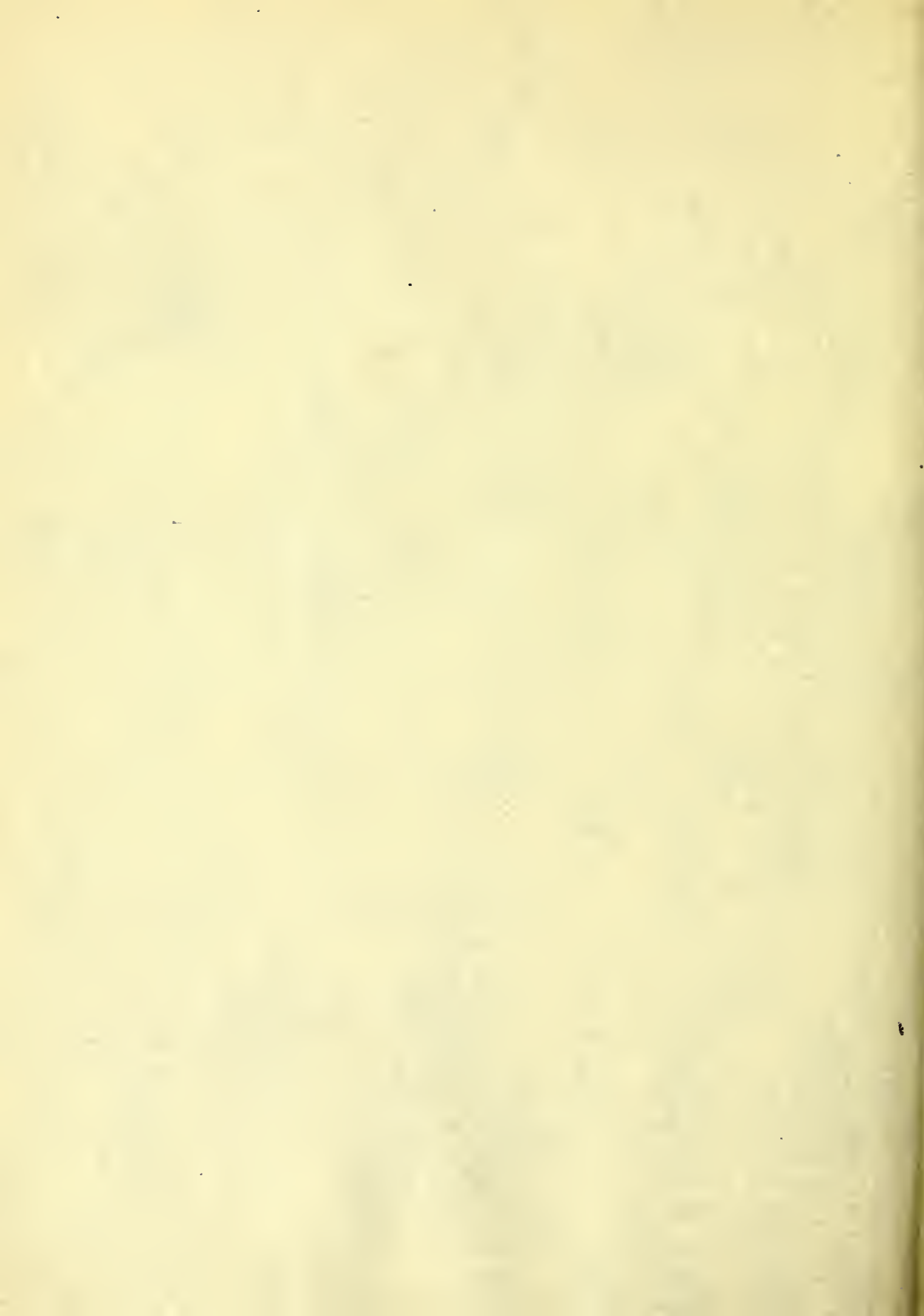
SECOND ST



SECOND ST

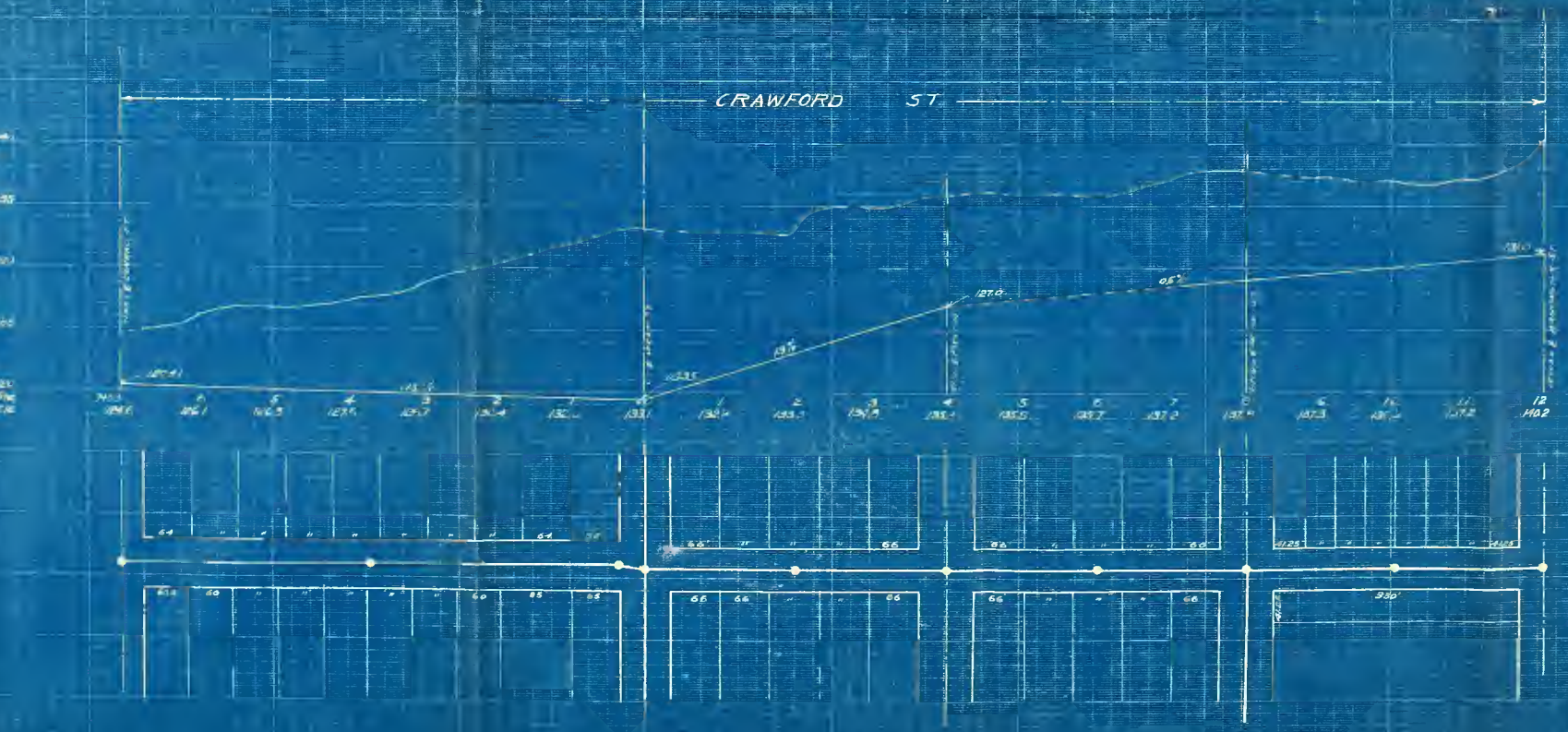
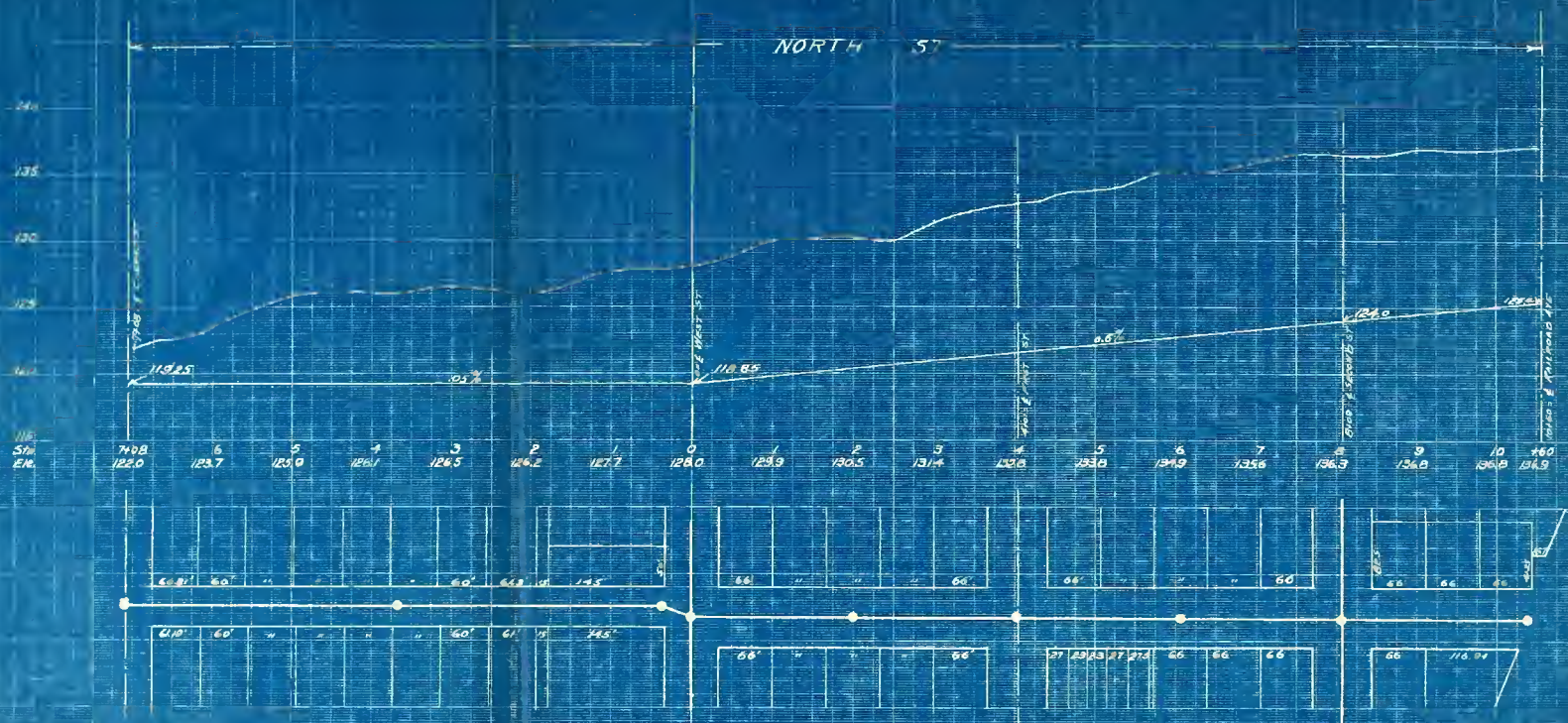






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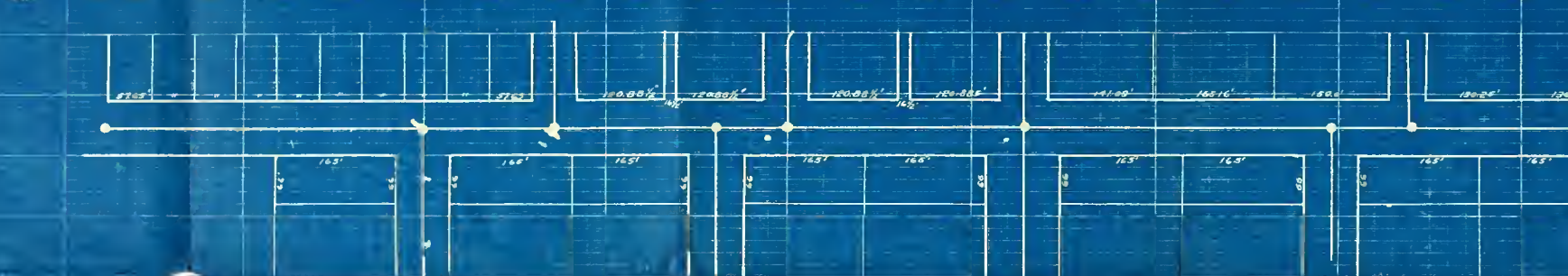
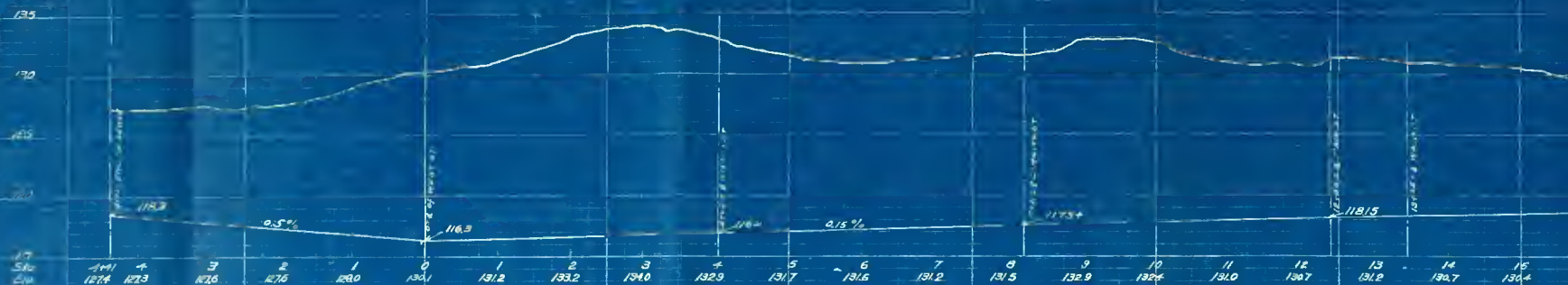




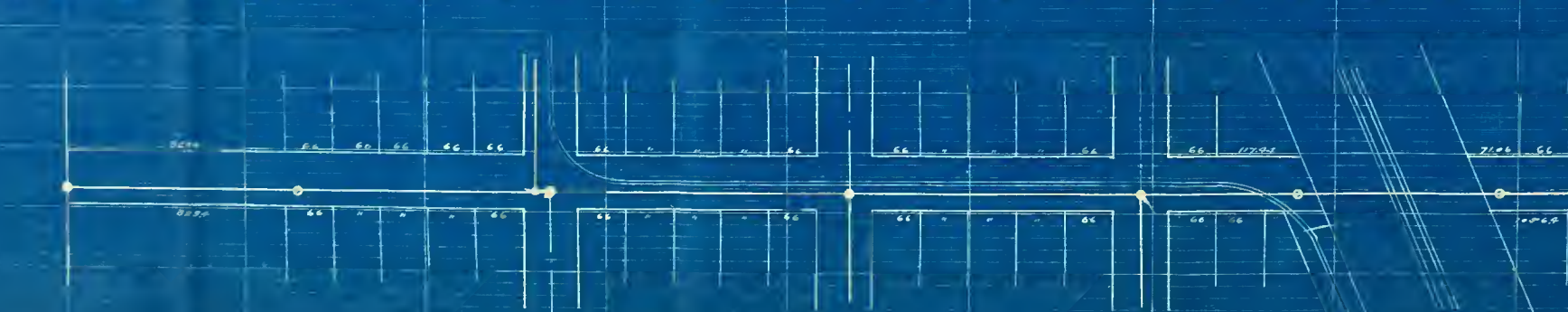
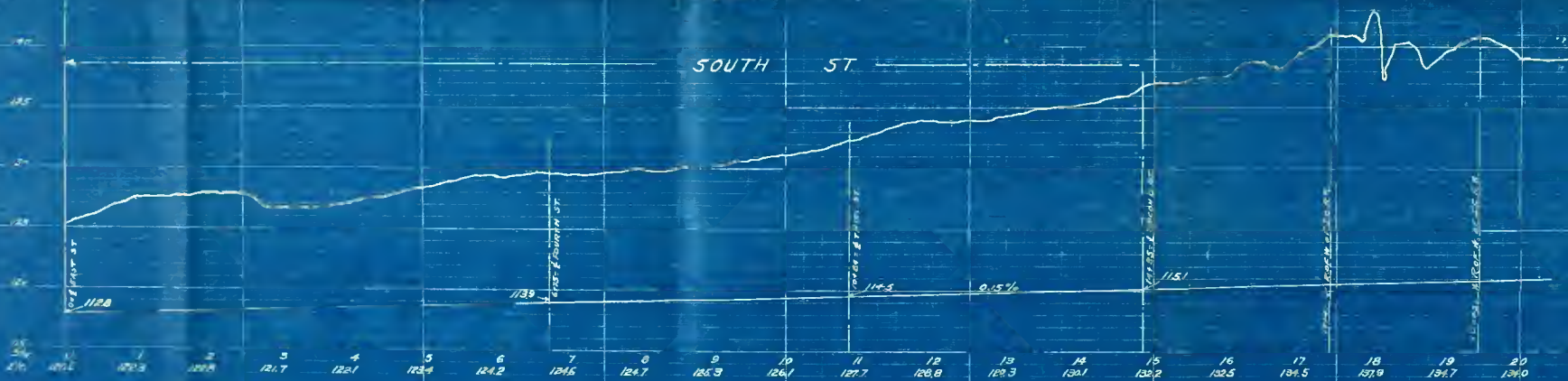
W + Smith

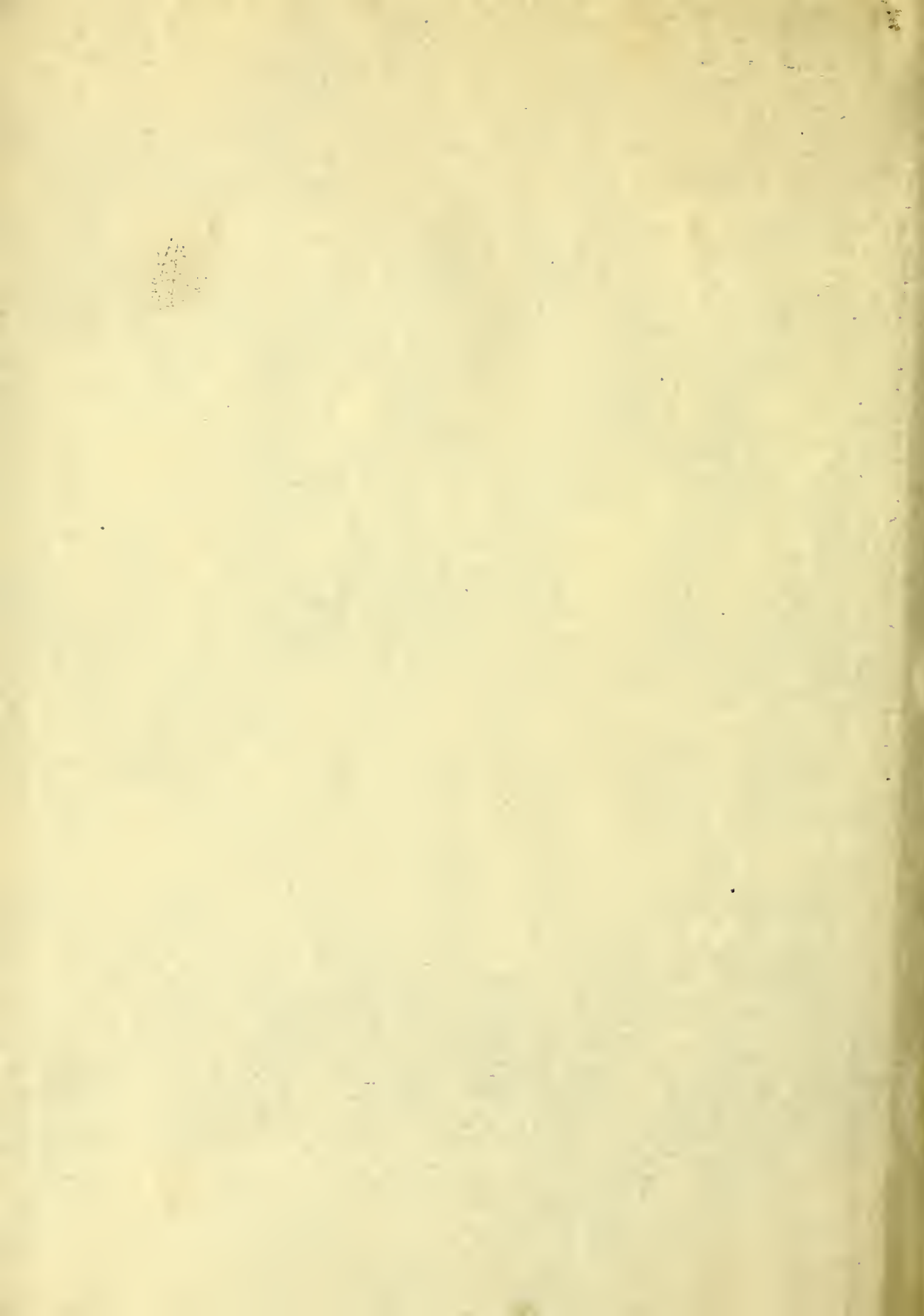
WEST

ST.



SOUTH ST.

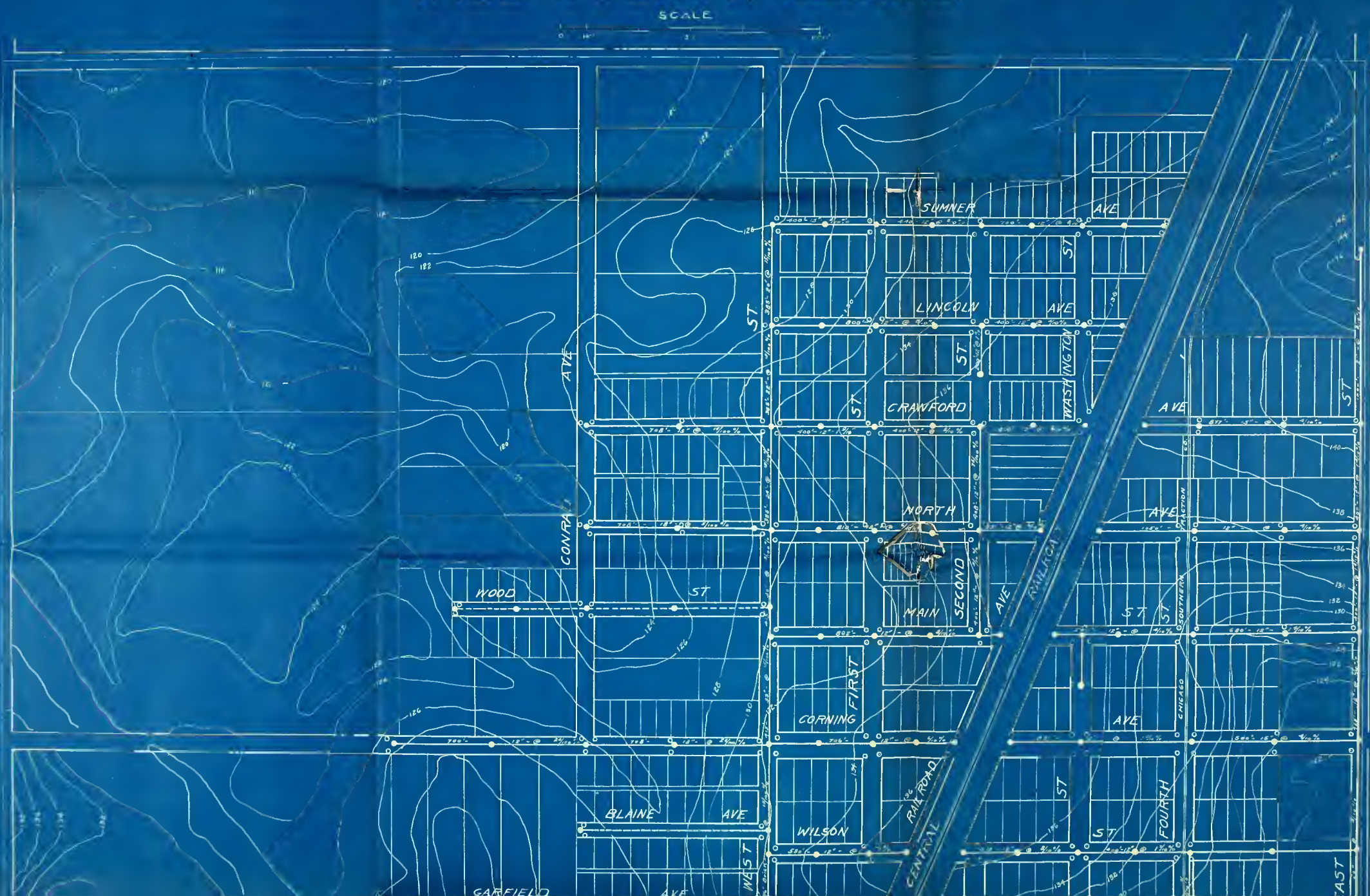




7/11/12

VILLAGE
OF
PEOTONE
WILL COUNTY, ILLINOIS.

SCALE



PLAN
OF
PROPOSED SEWER SYSTEM

A
THESIS

BY

George H. ...
...

